HOW WE ARE SHELTERED


The MMCo.

HOME AND WORLD SERIES

HOW WE ARE SHELTERED

A GEOGRAPHICAL READER

BY

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PREFACE

The most marked tendency in the educational movement of to-day is the effort to make the experience and the power gained within the school fit into and supplement the life without. Education has been, and is, too largely a process of dealing with abstractions, with expression rather than with experience. By a strange perversity we have insisted upon presenting to the child that which is distant in place and time, and we have then wondered why he was so ignorant both of that and of the life about him.

Education is the application and the enlargement of experience, resulting in the development of the individual. Geography is one of the important factors in education. All real knowledge of geography is based upon experiences derived through study of the home surroundings and relations. To-day, as never

before, the home and the world, the individual and the millions of mankind, are bound together by ties as strong as chains of steel, yet as sensitive as nerves.

In the teaching of geography, we should help the child to grasp, as far as he is capable, those physical and human conditions by means of which the life about him, *his* life, is maintained. This involves the presentation of conditions and peoples remote from him, it is true; but whatever line may be followed, the pupil soon becomes aware that the study of the subject begins and ends in the home, while it encompasses the world. This furnishes the only real foundation for all later study of geography.

Since much of the thought and activity of every individual and nation is centered about food, clothing, shelter, transportation, and communication, these should be made the corner stones of home geography. But while these are the central thoughts, the countless opportunities which they present to teach facts and truths aside from them should be seized by the

teacher. Indeed, if this be not done, the work falls far short of its purpose.

Much of man's progress has grown out of coöperation and specialization, and his present daily life is, in large measure, dependent upon them. This great truth, applicable to the family, the community, the school, the world, is not sufficiently developed by teachers and parents. In the abstract it means nothing to the child, but in this work he is repeatedly brought face to face with it, in ways that show clearly how his own welfare and happiness depend upon the labor and the thought of others, and how he, in turn, should contribute to the benefit of those about him.

Maps and globes should be constantly used by teacher and pupils. All places mentioned should be definitely located and routes of travel traced. The pupil should see the position of places with reference to his home, and should have some idea of the time required to reach them.

While the books of this series are called geographical readers, they are calculated to

perform a much larger function than do supplementary books. Where the plan here presented is followed, lessons will be assigned and the books used as regular texts. In the school with which the author is connected this has been done for several years.

More and more we are realizing the value of good illustrations in our schoolbooks. In the preparation of this volume no effort has been spared to secure pictures which actually illustrate the work undertaken. It remains for the teacher to use them in the most effective manner.

I take this opportunity of expressing my indebtedness to Miss Kathrine Lois Scobey of Dearborn Seminary, Chicago, who read the entire manuscript and furnished many valuable suggestions.

Trusting that this little book may be of real service in the great field of education, I submit it to my fellow-teachers.

JAMES FRANKLIN CHAMBERLAIN.

Los Angeles,
California.

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INTRODUCTION

This afternoon I stood in front of a large schoolhouse, and watched the children march out. Down the stairs and out into the yard they came keeping time to music. As they passed through the gates they began to separate, each going to a different place, yet each going *home.*

About five or six o'clock each evening one may see a stream of men and women coming from the mills, factories, and business houses of a great city. The work of the day is over, and each of the workers is going home.

People often leave their homes to go to the seashore, to some lake, to the woods, or to the mountains, for a vacation. Some cross the ocean and travel in foreign lands. It is pleasant to

watch the great blue waves with their shaggy crests of white, rush against the rocks and dash themselves into spray. To sit beside some laughing stream, and watch the fish as they play in the clear, deep pools, brings rest and joy. A visit to other countries is full of delight. But no matter where we may go; no matter how much we may enjoy our visits and vacation trips, we are always glad to return to our homes.

What is this home of which we each are so fond? It is a house, you answer. Yes, it is a house. It is a place where we are sheltered from the winter's cold, the summer's heat, and storms of all kinds. Here we are provided with food; and here we sleep at night. Home, then, is the place to which we go for food, shelter, and rest. But it is much more than this. All of these things are provided in hotels and boarding houses, but we do not think of these places as homes.

The home is the place of all the world most dear to us. Here we enjoy the love of mother, father, and all of the members of the family, and

give ours in return. Here the thoughts, the words, and the actions are those of love. The streets, the parks, the cars, the schools are for *all*. The *home* is for the family.

Fig. 1. — A Bird Home.

Many animals as well as people have homes. Sometimes animals occupy the same house for several years; and sometimes they use it for but one season. Animals often show much skill in building their houses.

Here is a bird home. If you wish to visit it, you will have to use a ladder or else climb the

tree. The owners reach their home much more easily. The house is made of twigs, and is lined with hair and bits of thread. How patiently the parents worked in building this home! In it the baby birds eat, sleep, and grow, while they are rocked by the breezes.

Squirrels build summer homes of leaves and twigs high up in the tree tops. In winter they live in houses in the hollows of the trees. During the bright autumn days the squirrels carry nuts and acorns to these snug homes.

The muskrat builds a winter home of coarse grass and reeds. It is in a marsh or by the edge of a lake or stream. The beaver carries sticks, stones, and quantities of mud out of which he builds his *lodge*.

Bees and ants are wonderful builders. They live in *communities* rather than in families. They are very industrious. Have you ever watched ants as they worked?

The homes of animals differ greatly. Some are *in* the ground, some are *on* the ground, and some are far *above* the ground. They are made of different materials and in different ways.

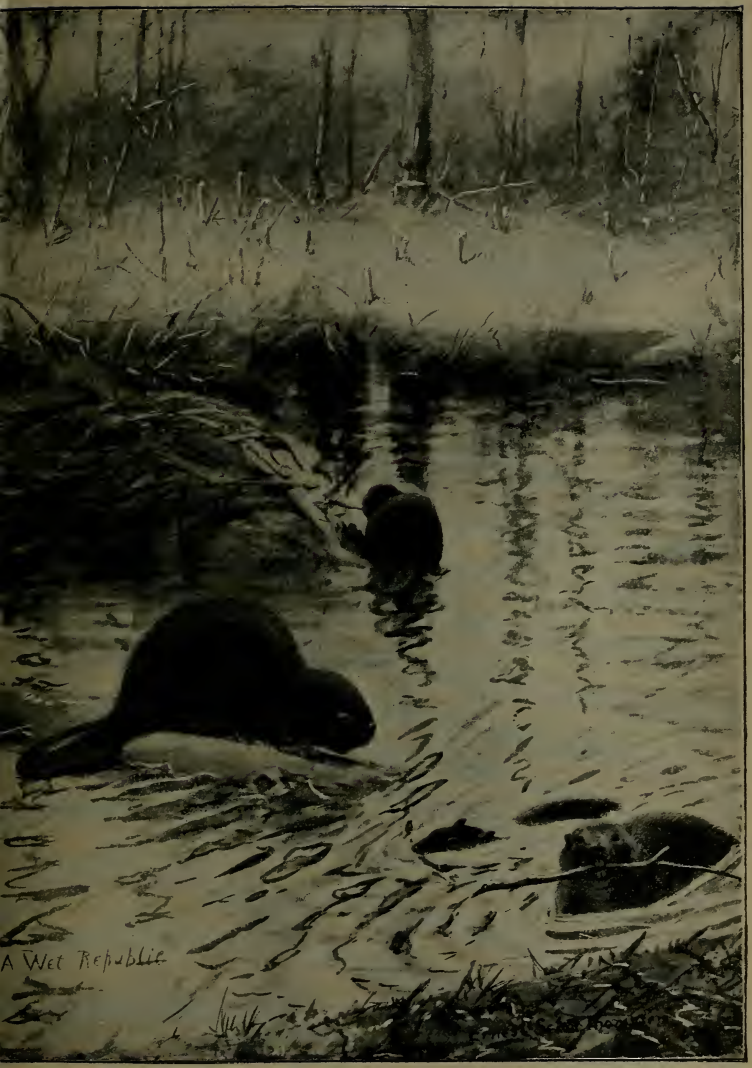

Fig. 2. — A Beaver Lodge.

The homes of people differ very much also. You know that the homes in your neighborhood differ in appearance. Some are large, and some are small. Some are built of wood, some of brick, and others of stone. These are not the

Fig. 3. — Hawaiian Grass House.

only materials used. Some houses are made of grass; some are made of skins; some are made of mud. The Eskimo builds his house of snow and ice.

The material of which a house is built depends upon climate, upon what can be obtained to

Fig. 4. — Laplander's Winter Home.

build with, and upon the skill of the builders. Some people, like animals, wander about a great deal in search of food and water for themselves or for their flocks. Naturally such people cannot have *permanent* homes. The home of the Indian is often carried from place to place.

Fig. 5. — Hut on the Kongo River.

There is a difference between country homes and city homes. In the country each family has its own house, usually made of wood. In a great city there are many buildings known as *tenement* or *apartment* houses. In one of these

Fig. 6. — A Home in the Country.

houses there may be fifty families. Each family rents a few rooms from the owner. Of course there are many city people who own their homes. Brick and stone are used a great deal in cities because of the danger from fire.

You know that food and clothing are necessities of life. In most parts of the world *shelter* is also a necessity. In some parts each man makes the house for his family. Did the people in your neighborhood make their own houses?

Fig. 7. — An Apartment House in New York City.

Of what are they made? Where did the materials of which they are made come from?

Let us take a journey together, and visit homes in our own, and in other countries. We shall learn how these houses are made, and of what they

are constructed. We shall also become somewhat acquainted with the people who live in them, and with the countries in which we travel.

SHELTERED BY SNOW

You have probably played in the snow many times. Perhaps you have made forts of snow, and dug caves in some great white drift. I am sure, however, that you would never think of making a house of snow to serve as your home during the long, cold winter.

People *do* make houses of snow, and they keep warm in them, too. These people are our Eskimo friends, who live in the far northland. There are no forests there, for it is too cold for trees to grow. For many weeks during the winter the sun does not shine, for there is one long, unbroken night.

When the Eskimo gets ready to build his winter home or *igloo*, he selects a place where the snow is deep and firmly packed. With a long knife of bone he cuts a great block from the snow, and throws it to one side. He then stands in the hole thus made, and cuts out other blocks.

The blocks are from eight to ten inches in thickness, about two feet wide, and perhaps two and one-half feet in length. These are placed on the snow, end to end, forming a circle.

Fig. 8. — Building Igloos.
From the *Report of the National Museum*, 1901.

A second row of blocks is placed upon the first, and so on, each circle being smaller than the one below it. At last only one great block is needed to finish the igloo. Putting this last one on is a little like putting a stopper in a bottle. You know that the bricks in a wall are laid so that the joints, as they come together, do not form a line. The Eskimo lays his bricks of snow in the same way.

When the igloo is finished, it looks like a great white bowl turned upside down. The little crevices between the blocks are carefully filled with snow, for the breath of the frost king is bitter cold; and it must not be allowed to enter.

But the house is not finished when the walls have been laid. Neither doors nor windows have yet been constructed. When the Eskimo wishes to make a door, he cuts an opening underneath the lowest layer of blocks. Then he makes a burrow or tunnel in the snow for some distance. This is the entrance to the house. Skins or blocks of snow are placed before the openings to keep out the cold. The window is a cake of clear ice set in the wall.

Your home has several rooms. Perhaps it is more than one story high. An Eskimo house consists of but one room. There is very little furniture in the house, but of course there is a bed. What do you suppose it is made of? Snow!

At one side of the igloo the snow is packed hard, and upon this, moss, grass, and twigs are placed when they can be obtained. Over these,

heavy skins are laid, and the softer skins and furs that serve as bedclothes are spread on top.

Another thing that would interest you very much is the stove. It is not purchased at a store, but like nearly everything else that the

Fig. 9. — An Eskimo Home.

Eskimo people use, is made by their own hands. The stove is nothing but a stone that has been hollowed out. It is both a stove and a lamp. Some whale oil and a wick of moss complete it. I will tell you more about it in another place.

The heat from this lamp keeps the house quite warm when the entrance is closed. Sometimes it is so warm in the igloo that water drips from the ceiling of snow. When it is very cold the moisture from the breath of the people collects on the ceiling, forming beautiful crystals which sparkle like jewels in the light.

On the walls are bear, seal, and walrus skins. Some articles of clothing, bows and arrows, harpoons, knives, cups, and pails are to be seen. The cups and pails are made of seal-skin. I am afraid that you would not think the igloo a very comfortable home. The "children of the cold" know of no other kind of home; and they are quite happy in it. They know nothing of cakes, pies, and other dainties with which you are familiar. They are as delighted with pieces of fat from the seal, reindeer, or walrus as you are with a chocolate cream. Often their food is eaten raw. Sometimes they are so hungry that they are glad to eat bits of the skins of these animals.

Although the winters are very long and cold, the Eskimos do not remain indoors all of the

time. The men must go in search of food, and sometimes the women go with them. The children have great sport riding on their sleds which are drawn by dogs. The sleds are called *kamutees*, and the dogs *mikies*. When at last the winter is over and spring has returned to the northland the igloo begins to melt. The walls must be patched up for a short time, but soon the house has to be given up entirely.

Now the *tupec* or tent must be built. This is the summer home, and is made of the skins of the walrus and the seal. A number of these skins are sewed together. The tent poles are the long bones of the walrus and whale.

During the summer the Eskimo people move about a great deal. This is the season when most of the hunting and fishing is done. The snow and ice have melted and the boats can be used. The boats are made of skins, and have ribs of bone. The boat used by the men when hunting the seal is small and light. It carries but one person, and is called a *kayak*. There are larger boats, known as *umiaks*, in which the family sometimes move from place to place.

Even in Eskimo land there is some grass in summer. Mosses and a few flowers may be seen. Birds build their nests in sheltered places among the rocks and raise their families. The children enjoy the summer very much. They have plenty of time to play, and they also hunt

Fig. 10.— The Tupec.

for eggs and thus help to supply the family with food. They gather moss and roll it into large strings to be used as wicks in the stone lamps. A supply of this moss must be gathered during the summer. Why?

There are Eskimos on the west and the east

coasts of Greenland, in the region around Hudson Bay and in Alaska. Find these regions on your map. The homes differ in the different sections. In some places the winter home is made of stones and earth. In the places which the white men have visited, a good deal of wood is used in building. In these homes are found many things, such as cloth, needles, thread, knives, guns, and dishes which the Eskimos have obtained from their white visitors.

There is very much more to be told about these northern neighbors of ours, but I am sure that you now feel somewhat acquainted with them. You have many things which the children of the snow do not have, but they would be no more contented in *your* home than you would be in theirs.

HOMES IN CLIFFS

In the southwestern part of our country are to be seen some of the most interesting houses in the world. I have called them *houses*, but they are little more than niches in cliffs on mountain side or cañon wall, and so they come to be called "Cliff Dwellings," and the people who once lived in them, "Cliff Dwellers." Although the people who inhabited these deserted homes have long since passed away, their descendants still dwell in that thirsty land, in homes almost as wonderful as those of their ancestors.

Rock is often found in layers or *strata*, like the leaves in a book, only, of course, many times thicker. Along a mountain or cañon side, the edges of many strata are frequently exposed to the weather, and some wear away much more rapidly than do others. In the spaces left by the wearing away of the softer rock, the Cliff Dwellers made their homes.

I once visited one of their silent villages. It consists of three stories of rooms perched on the edge of a cañon. In front is a ledge but a few feet in width, and when I dropped a stone over it, down it plunged farther than it would if it had been dropped from the top of the highest building in New York City. Think of the dark-skinned babies who once toddled about these narrow front yards, without wall or fence between them and this great chasm.

There was no one to greet me as I entered the empty rooms. I was obliged to stoop a little, for the ceiling was low. The height of the rooms depended upon the thickness of the layer of rock that once occupied the space. There was not much building to be done in making a cliff dwelling, for the roof and rear wall were provided by nature. A wall of rough stones plastered over separated the rooms, which were smaller than ordinary bedrooms in our homes.

Outside, the yellow sunlight fell upon the rocks, and sifted between the branches of the tall pines, but these houses of stone were gloomy, for little sunshine could enter them. There

were no windows, and the single entrance to each house was small, so that enemies would not find it easy to enter.

House cleaning had not occurred here for a long time, for there were several inches of sand

Fig. 11. — A Cliff Dwelling.

on the floor. I dug into this sand, and found bits of pottery, and some dried and shrunken corncobs. Do you wonder how the cobs came to be there? The people cultivated fields of corn on the lowlands, and ground the kernels between stones. The stove was a hole in the floor, and the chimney an opening in the roof.

As I looked across the deep, wide cañon at my feet, I could see on the farther side another row of cliff dwellings exactly like those I was visiting. I could almost fancy that I saw dark figures moving to and fro, cultivating the little fields of corn far below, and patient women slowly toiling up a flight of steep steps, cut in the face of the cliff, to the houses far above.

A PUEBLO HOME

Little Kōpē'lĭ is a child of the desert. He has never seen a train of cars, a street car, or an electric light. He knows nothing of the telegraph or the telephone, and he has never ridden on a bicycle, or in an automobile.

Cool, shady woods and soft, green meadows are not seen where Kopeli lives, for it is a land of little rain. Most of the scanty vegetation is quite different from that with which you are familiar. A curious plant often found in this country is the *cactus*. Do not touch it, for it is covered with sharp spines. See how thick and leathery the leaves are. This helps it to live in a dry climate. It bears a fruit which is yellow when ripe. Kopeli has often eaten it, but you would not think it very good.

This desert region of which I have spoken is in the southwestern part of our country. Most of the people who live there are Indians who are

Fig. 12. — A Cactus.

called *Pueblos*. Pueblo means village, so I hardly need tell you that these people live in villages. Generally we find but one family of Indians in a house, but this is not the case with the Pueblos, for a whole village may consist of but three or four dwellings. The Pueblos are the descendants of the Cliff Dwellers of whom I have told you, and nearly all of them live in New Mexico.

When the father of Kopeli wanted to build a house, he did not go to a carpenter, but, with the help of his wife and neighbors, did the work himself. Before beginning the dwelling, however, he went to the chief of the village. The chief took four eagle feathers, sprinkled them with meal, and blessed them. Folding the feathers carefully under his blanket, Kopeli's father carried them to the spot where the house was to stand. With reverent hands he placed a feather at each corner, covering it with a stone. There were other ceremonies connected with the building of the house. One of the prettiest was the singing of songs to the sun.

Strange as it may seem, the Pueblo mothers

do much of the work of building their houses. The houses, and all that they contain, belong to the women instead of to the men. Kopeli watched while stones were collected, and built into the walls of the house, which were then given a coating of plaster made of mud and water. The floor was made of the flat stones, over which a coating of this same plaster was laid.

From the mountains the men brought long poles about six inches in diameter. These they placed across the top of the walls. Kopeli's mother and the other women placed willow branches upon the roof poles. Over these they placed grass and twigs, and then a coating of mud. The roof, like all of the others in the village, was nearly flat.

In one corner of the house a fireplace and a chimney were built, and around the walls some rough benches were placed. The house had two small windows of glass, but in earlier times the people used thin pieces of a translucent stone.

The Pueblos are fond of bread, so the mealing stones were not forgotten. These stones are used for grinding the grain, and they take the

place of flour mills. They are smooth and flat, and are placed on the floor along one side of the room. Kopeli's mother, sitting on the floor, grinds the corn between two of them. If she

Fig. 13. — A Pueblo Dwelling.

wants very fine flour, she uses the smoothest stones; if coarser flour, the rougher ones.

Each house has its loom on which blankets and clothing are made. The weaving is quite commonly done by the men. They raise their own sheep and cotton, and they dye the yarn bright colors.

As I have said, a Pueblo village sometimes consists of but three or four houses, each of which may contain two or three hundred rooms. The pueblo of Pecos, New Mexico, has one house in which there are nearly six hundred rooms. Some houses are but one story high, while others are five or six.

You must not suppose that these large houses are built in a few weeks or months as our houses are. They are built piecemeal, and are added to from generation to generation. When the houses are more than one story high, they are built in terraces, the roof of the first story forming the front yard of the second, and so on. Ladders are often used to climb from one story to another.

There is little in a Pueblo house to make it comfortable or beautiful. There are no couches, carpets, curtains, dressers, pictures, pipes for hot and cold water, gas or electric fixtures. All of the water used in the village is carried by the women, from a stream some distance away, in earthen jars or baskets lined with clay. In spite of this lack of conveniences, Kopeli is happy in his home.

The Pueblos are farmers. They raise corn, beans, red peppers, squashes, melons, peaches, tobacco, and cotton. They dig ditches from the streams to their gardens, and so water their crops. This is called *irrigating*. In the autumn, strings of sliced squashes, pumpkins, and peaches may be seen drying on the roofs of the houses.

Of course the crops could not be raised without rain, and these people have some strange ceremonies which they seem to believe will cause rain to fall upon the thirsty soil. One of these is known as the snake-dance. Bands of nearly naked men dance to and fro, carrying about their arms and necks, and even in their mouths, deadly rattlesnakes. The ceremony is a religious one, and it means a great deal to these people.

We must bid good-by to little Kopeli, but we shall not forget him, nor his strange home perched upon the rocks in New Mexico.

INDIAN HOMES

When Columbus discovered America, he found the land in the possession of a race of men whom he called *Indians*. Columbus supposed that the country upon whose shore he had landed was India, so you see why he named the people Indians.

Indians used to live in all parts of both South and North America. They roamed over the land upon which Boston, New York, Chicago, and other large cities now stand, and their camp fires gleamed beside every lake and stream. Perhaps your own front yard was once chosen by some squaw as a good place on which to erect a wigwam for her papooses.

There were many wars between the white men and the Indians, but in the end the Indians were always defeated. To-day most of the Indians of North America live in the West on *reservations*. A reservation is a tract of land set apart

by the government for the use of the Redmen. There are many different tribes of Indians, and they build somewhat different styles of houses. Many have fashioned their homes after those of the white people.

The Indians have always been great hunters. In the early days they did little besides hunting, fishing, and fighting. As meat was their chief food it was necessary to follow the great herds of buffalo, elk, and other animals from place to place. The ponies, too, needed new pasture ground from time to time. Because of this, the people did not build permanent dwellings as we do, but rather houses that could be easily and quickly constructed. Poles, skins, bark, leaves, grass, and even dirt were used. Often the house was carried or dragged by ponies from place to place to save building a new one each time they moved.

For their homes Indians have many names, such as lodge, wigwam, tepee, wicky-up, hogan, and kan. By the Indians who live on the plains, the house is often called a *tepee*. As you see by the picture it is cone shaped. In the early

days it was covered with buffalo skin. Upon it were paintings in bright colors representing battles or hunting scenes. To-day the covering is of cloth. Do you know why?

FIG. 14. — A Tepee.

From the *Report of the National Museum*, 1901.

The frame of the tepee is of poles twelve to sixteen feet in length. Notice that they are tied together at the top and spread out at the bottom. The cloth is sewed in strips, and placed over the frame. The door, you see, is like the flap of a tent.

If you could see a house being set up, you would be surprised to see that the Indian women, who are called squaws, do all of the work. They spread cloth on the ground where the tepee is to stand. Then they tie three of the poles together at their small ends, using thongs for the purpose. A minute more and the poles are pushed under the cloth and through the opening at the top. You would know this was not the first tepee that the squaws had set up, or they could not so easily lift the house to its place. Look how they spread the poles far apart at the bottom. One by one the other poles are fastened in place. Tap! Tap! Tap! The squaws are driving a few pegs into the ground, fastening the tepee at the bottom; and now the work is finished, and the family can move in.

You notice that the cloth does not come together at the top of the tepee. The opening takes the place of a chimney. A fire is built on the ground in the middle of the house. A kettle is hung over the fire, and here the cooking is done. Around the edge of the tent are skins

and blankets upon which the members of the family sleep.

Here are some houses made by the Wichita Indians. The one on the left looks like a pile of hay or an old-fashioned beehive. At the right are two workmen building a house.

Fig. 15. — Wichita Indians building a House.
From the *Report of the National Museum*, 1901.

They select poles and push their large ends firmly into the ground. They then tie the ends together at the top, as you see. Now smaller poles are bound to these horizontally, forming circles like the hoops on a barrel. Next wisps of grass are woven over the framework, and the house is complete.

This is the home of a family of Navajo Indians. The part at the right is called the *hogan*. It is a great mound of earth placed over a framework of poles. Underneath the dirt is a layer of bark and weeds to keep it from falling through into the house. You can see the hole

Fig. 16. — Navajo Hogan and Ramada.

at the top which serves as a chimney. How would you like to live in such a house?

Adjoining the hogan is a summer house. This is called the *ramada*. It is covered with boughs and grass, and serves to keep off the bright sunshine.

In California, Utah, and Nevada live the Digger

Indians. They received this name because they dig roots from the earth, and use them in various ways.

Fig. 17. — An Apache "Kan," or House.

The chief food of the Diggers is acorns. They make long trips across the mountains in search of these, carrying them home in baskets such as you see in the picture. Then the women grind them in mortars of stone, and bake a sort of bread from the flour.

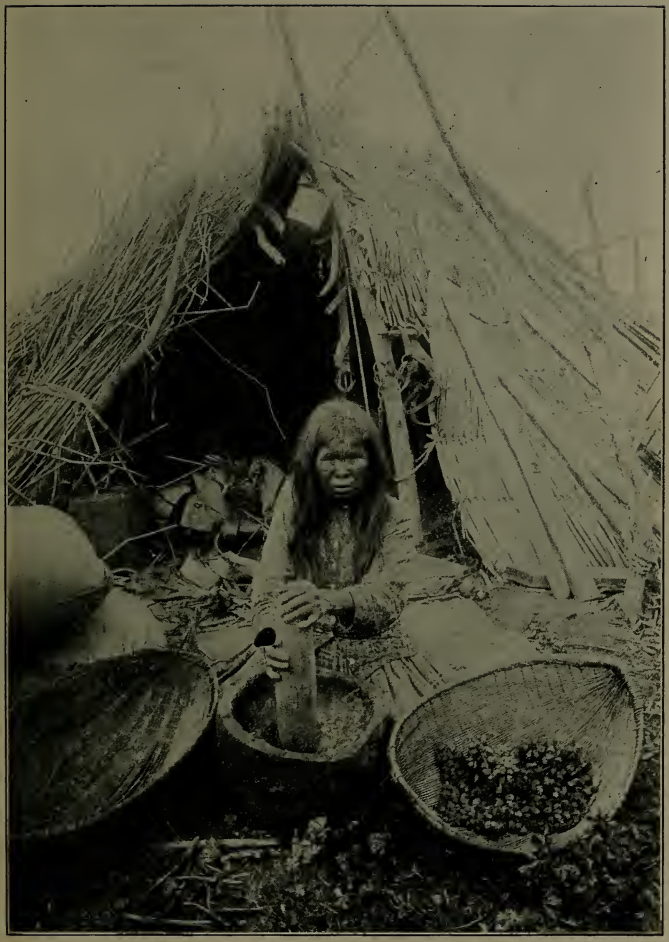

Fig. 18. — Home of a Family of Digger Indians.

The home, as you see, is made of rushes. They are bound together, and fastened to a frame-work of poles. Just think of the difference between this house and the one in which you live.

THE DWELLINGS OF THE DWARFS

Far off in the central part of Africa there are great dark forests. The trees are so thick, and their branches are so closely woven together, that little sunshine finds its way to the ground. In fact it is almost like twilight in these forests all day long.

It is very difficult to journey through this region. Hanging from the trees are rope-like plants called *lianas*, while vines and creepers entangle the feet of the traveler, and fallen trees block his way. Most of the paths belong not to *men* but to *animals*. Some of them were made by the feet of elephants.

Of course we know that there are no such things as *sprites*, *goblins*, and *brownies*, yet in these gloomy forests there is a race of people so small, and so full of pranks, as almost to make us believe in them. These little creatures are called *Pygmies*. When full grown, they average

about four and one-half feet in height, or about as tall as a ten-year-old boy. Although they belong to the Negro race, some of them are reddish brown in color.

The Pygmies are real hunters, and do not till the soil at all. Their weapons are bows and arrows, spears, and knives. The arrows are generally poisoned. So skillful and so brave are these little people that they kill the largest animals, even the elephant.

The Dwarfs usually live close to some tribe of larger Negroes, who have banana plantations and fields of sweet potatoes. The Pygmies are very fond of these things. Sometimes they exchange meat, skins, ivory, and feathers for them, and at other times they help themselves by night. If their larger neighbors take this good-naturedly, the little people will leave presents for them, pull the weeds from the plantations, and kill the animals that would destroy the crops while the owners are sound asleep. Are they not like the brownies?

It is not an easy matter to visit these little creatures, for although they are brave and even

cruel, they are also very shy. Generally they will not allow white men to see them unless the larger Negroes tell them that they will not be harmed.

The Pygmies have no dogs, horses, cattle, or domestic animals of any sort. They wear but little clothing, and their homes are very simple. Although they live in villages, you might pass very close to one of them, and not know it, for the buildings are very low. There are no chimneys rising above them, and there are no stores, mills, or factories. The homes are arranged in a circle, that of the chief being in the center.

When the Dwarfs wish to build a house, they cut a number of light poles, and bending each into the form of an arch, push the ends firmly into the ground. These form the frame of the building. Next, grasses and broad leaves are woven between the poles, forming a thatch. How high do you suppose one of these houses is? A man of average height could not stand erect in one, for they are but four or five feet high! Often the breadth is no greater than the height.

Let us imagine ourselves entering one of these little homes. We cannot *walk* in, but must get down on our knees. A small bush standing in front of a hole in the wall, is the door. We push this aside, and crawl in. How dark it is! There is not a window in the house. Soon our eyes become accustomed to the darkness, and we examine our surroundings. The house consists of but one room. There are neither stoves, tables, chairs, nor furniture of any kind. Yes, there is a bed, but it is simply a pile of dry leaves. We are very much surprised to learn that the children, when quite small, are placed in tiny houses by themselves! How would you like to live in that way?

The Pygmies are, at times, quite frolicsome. They laugh, sing, dance, and imitate in various ways the things which they have seen others do. They have been known for a long time, but few white people had seen one of them until the summer of 1904. During that year a missionary brought a number of them to the Saint Louis Exposition. This gentleman had visited the Dwarfs in Africa, and they felt that he was

their friend. Yet even *he* had great difficulty in persuading them to leave their forest homes, and I am sure that they were very glad to return to them.

WHERE THE CHRYSANTHEMUM GROWS

Near the western shore of the great Pacific Ocean, and a little to the east of China, is Japan.

Fig. 19. — The *Mongolia*.

Can you point to it on the map? The country consists of many islands, most of which are very small. Let us imagine that we are making a

journey to that far-away land. We leave San Francisco on the great steamship, *Mongolia*, and after traveling over the blue waters for about three weeks we reach Yokohama, the great seaport of Japan. The *Mongolia* is six hundred and fifteen feet long. If a twenty-story building were placed sidewise on the vessel, it would not reach halfway from bow to stern.

After attending to our baggage we leave the wharf to look for a cab. A large number of men shouting and waving their arms is gathered not far away. They are dressed in blue, and wear shallow oval hats. As we draw nearer we see that each is beckoning to the passengers and calling, "'Rik'-sha?" "'Rik'sha?" Jinrikisha is an odd name for a two-wheeled cart or carriage, is it not? — but it is still more odd for it to be drawn, not by a horse, but by a man. The name really

Fig. 20. — A Jinrikisha.

means *man-carriage*. It must be much easier to draw this small 'rikisha than that one which carries two people.

The 'rikisha man agrees to take us about the city, so we get in. He steps between the shafts, and taking one in each hand he trots off, drawing the load as easily as your pony draws the dog cart. Hour after hour he trots on, stopping only when we ask him. Then we must hold fast, for the stop is so sudden that we are liable to be spilled out.

Yokohama is quite different from the cities of our country. The buildings on both sides of the narrow streets are lower than they are at home. There are few horses and wagons to be seen. Men do much of the work that is done by horses in the United States. We see many 'rikishas, and occasionally a person riding in a sedan chair, for street cars are not common.

Let us ride out in the country where farms are very small. Instead of seeing plows, harrows, and harvesters in the fields, we see men tending the crops by hand. Many rice fields are to be seen, for rice, you know, is the chief food in Japan.

Patches of bamboo are common. The bamboo is a great friend to the Japanese people. It serves them for water pipes, for fan and umbrella making, even as material for furniture and houses. Strange to say, this good friend is used even as an article of food, for the young shoots of the bamboo are as tender as asparagus.

Fig. 21.—A Bamboo Grove.

The Japanese are very fond of flowers and nearly always have them in their homes. Sometimes their gardens glow with the brilliant hues of chrysanthemums; sometimes they shine with the bright tints of azaleas, of red peonies, and beautiful blue irises. Sometimes the loveliest flowers are found in the orchards, and when the

cherry trees grow white with blossoms the Japanese children clap their hands with delight. As the breezes stir the branches the petals drift down almost like snowflakes. But before they have all been blown away their beauty is celebrated by a festival in which old and young together rejoice in the feast of the cherry blossoms. In our country cherry trees are planted for their fruit, but in Japan they are planted for their blossoms. Is not this a beautiful custom?

Very tiny are the houses. They are usually but one story in height. The roofs seem much too large and heavy for such frail walls to support. This one is *thatched,* as many of the roofs in the country are. The thatch is sometimes of grass, and sometimes of straw or reeds. It is bound in bundles, and then tied to the rafters of the building. Then a man with a great pair of shears, such as we use for cutting hedges, trims the thatch. The roof is very thick and extends for some distance beyond the walls. Frequently the roofs are made on the ground, and then raised on bamboo poles.

Of course much dirt collects on the thatch.

Seeds lodge there also. Because of this we see grass and weeds growing on many roofs. Beneath the eaves are troughs made of bamboo. Some of the roofs are tiled and some are shingled. When a roof is to be tiled, boards are laid on it and upon these mud is placed. The tiles are then pressed into the mud. Japanese shingles are much smaller than ours, and the carpenter uses bamboo pegs for nails.

Here is the house to which we have been invited. Our friends see us, and come out to bid us welcome, as we step on to the veranda. Little Kiku makes a low bow and assists us to remove our shoes. Kiku means chrysanthemum, for many girls in Japan are named from flowers. Are not wistaria and hyacinth pretty names for the dainty little maidens? The Japanese never wear their wooden shoes or *geta*, as they call them, in the house. You will understand why a little later.

The door does not swing open as the doors in our houses do. It is a panel that slides back and forth, having a frame of wood and being covered with paper. The walls and the parti-

tions between the rooms are of this same material. The panels are usually about three feet wide.

The partitions between the rooms are arranged to slide in grooves made in the ceiling and the floor. Sometimes the partitions are of plain

Fig. 22. — Kiku's Home.

paper and sometimes they are ornamented with beautiful paintings. It may be a picture of Fuji-Yama, the sacred mountain, snow capped against a sky of cloudless blue. Or perhaps one sees soaring through the clear air birds of mar-

velous plumage; or perhaps it is a garden with blossoms of violet, of crimson, or of gold. Often these partitions are taken out, and the whole house is thrown into one room.

If Kiku could step into *your* house, she would be much surprised to see the glass windows. In *her* home, and in many others in Japan, the windows are of paper. The windows are called *shoji*. They are much like the paper walls between the rooms, but you notice that the paper is white. Paper of this color lets in more light. About two feet above the floor, in the shoji of some houses, there are pieces of glass.

The Japanese are skilled paper makers. Even their tissue paper is tough and durable, of a finer quality than that with which we are familiar. Paper is used for window panes every day in the year, but on one special day it is put to a still more curious use. That is the day of the festival for boys. Almost every flagstaff in the "Flowery kingdom" is decorated with paper fish, sometimes several feet in length, the gift of parents or friends. With wide-open mouths the fish wiggle and twist as they flap to and fro in the breeze.

Our friends do not ask us to take chairs, for there is not one in the house. Instead, we sit upon soft white mats that cover the floor. Little Kiku sits very quietly with her feet drawn up under her, and her hands hidden in the wide sleeves of her kimono.

Now you see why we left our shoes at the door. It would not do to soil these white mats. They are quite springy to the step, so there is no sound of heels upon the floor in a Japanese house. The mats are six feet long and three feet wide, and about two inches in thickness. The size of each room is determined by the number of mats that it is to contain. Would twelve mats cover a large or a small floor?

Near one end of the living room you see a low platform on which there are vases containing flowers. There are bright-colored flowers in nearly every room, for, as I have told you, the Japanese are very fond of them.

In *your* home the same pictures remain on the walls for years. In Kiku's home they are changed frequently, and only a few are in sight at one time. A Japanese artist paints a picture

very quickly. He uses few strokes and does not show as many details as would one of our artists.

Kiku goes to another room, and brings in tables—one for each person. You open your eyes wide in surprise, for the tables are only about one foot high. The white mats that cover the floor are our chairs. The maid brings in the dinner served in dainty dishes. We have soup, then salad, and finally rice, tea, and wafers. The teacups are about the size of half an eggshell, and the saucers as large as butter plates.

The tea is boiled over a little charcoal brazier called the hibachi (hĭ bä′chē). These are the only stoves which the Japanese have in their living rooms and bedrooms. In the kitchen there is a sort of range for cooking.

The hibachi may be a round or square box partly filled with ashes or sand and about as large as a cracker box. The teapot is placed on a three-cornered support which is pushed into the sand. The fuel consists of a few bits of charcoal. On cold days Kiku curls up beside one of these queer stoves and tries to keep warm.

We keep warm by living in houses that keep

out a great deal of cold, and by having hot fires in our rooms. When the people of Japan are cold, they put on more clothing. Would it not seem strange to attend a party where each one of the company sat on the floor beside his own stove? We might see such a sight were we to visit Kiku's home in the winter.

Where are the beds? Kiku has never seen a bed such as the one in which *you* sleep at home. She is not accustomed to snowy sheets and soft fluffy pillows. In Japan the mats are the beds. See, the servant is putting all of the partitions in place so that there may be enough bedrooms. What was the dining room a moment ago will soon be used as three bedrooms. Now some padded quilts are brought in. Some of them are spread upon the mats, and some are to serve as covers. It is very little trouble to make the bed, you see.

Look at those little wooden boxes, each covered with a roll of cloth. You cannot imagine what they are for, I am sure. They are Japanese pillows. Over each is spread a piece of paper to take the place of a pillow slip. You will think

the pillows very uncomfortable, but Kiku does not. She is wondering how we will enjoy sleeping in a Japanese house, for her parents have told her that our homes are quite different from hers.

Even in the country, most Japanese houses have bath tubs, and every night each member of the family takes a hot bath. Many of the bath tubs are round, looking a little like a half barrel. In one side of the tub is a charcoal stove whose fire heats the water.

Not all Japanese houses are like this one. Some have walls made of plaster instead of paper, and some are made of lumber. Stone and brick are not very commonly used in building. One reason for this is that there are so many earthquakes.

The last sounds that we hear are made by the servant in putting up the shutters that protect the shoji. This is locking up the house for the night. We are soon asleep and dreaming of our home in America.

A VISIT TO CHINA

China is a very old land. Its people are backward; most of them know almost nothing of the rest of the world, and very little of their own country. This is not to be wondered at, for there are very few railroads in this country.

The Chinese have not always been backward. They taught the world many things. They discovered how to make silk and they invented printing, the compass, gunpowder, and other things. These discoveries and inventions were made many centuries ago.

In the fertile portions of China the population is very dense, for the farms are hardly larger than the gardens in our country. Nearly all the work on the farms is done by hand. There is a man cutting grain with a sickle as it was done thousands of years ago. After the grain is harvested, women and children will pull up the short stalks that remain. They will carry these home, dry them, and use them as fuel. Farm

work is not well paid; the laborers usually receive about ten cents a day.

Everywhere we see canals. Some are large, and some are small. We see many curious boats on them. People travel along these canals as commonly as we travel along roads. Many farmers take their produce to market on boats.

Along the canals are houses within a few feet of the water. They are set up on posts, and are entered by means of short ladders.

You know that in our country the farm-houses are scattered along the roads. They are not built in groups. In China the farmers live in settlements. There are sometimes wide stretches of country between them without houses.

Usually the country houses are but one story high. Many very poor people build their homes of mud or of clay. Sometimes the frame of the house is of wood. To this, strips of bamboo are fastened, and mud is then plastered over the bamboo. Some houses have thatched roofs, and some are covered with tiles.

Let us step into one of these houses. You will think it quite cheerless, I am sure. There are no carpets, for the floors are simply hardened mud. The partitions are made of strips of

Fig. 23. — A Chinese Home.

bamboo woven in and out, and plastered with mud. There are chairs, tables, and beds, all made of bamboo.

In this house the windows are of paper, and have heavy wooden shutters. In many homes

the windows consist of a lattice work of bamboo. Pieces of thin shell are tied into the spaces thus formed.

There are no stoves such as we have in *our* homes. Here is a sort of box partly filled with sand. In it the fire is built. In some houses the stove is much larger, and is of brick and plaster. People put on extra clothing when it is cold. They even carry tiny stoves in their sleeves, and they have a sort of foot lamp, also.

The houses in the cities are larger and more substantial than those in the country. They are usually made of brick or stone. The roofs are generally covered with tiles. Often mats stretch across the street from roof to roof, for the streets are very narrow. These mats keep out the sunshine.

There are no fine residence sections as there are in our cities. The hovel of the very poor man often stands beside the home of the man of wealth.

In many cases the family of the merchant lives in the back part of the store. You can see some of the children observing you through

the open door as you make your purchases. They think your clothes very odd.

You do your trading by means of coins called *cash*. In the center of each there is a small square hole, so that they may be strung on a string or wire. It takes about twenty cash to equal in value one cent in our money. An ordinary purse, you see, would be of no value to you in China.

Although the streets in these cities are very narrow, there is much business done in them. People hurry and push their way along, carrying goods on their backs or on poles which rest on the shoulders of two men. Here comes a man riding in a sedan chair, and there is another riding in a wheelbarrow! In the city of Shanghai there are about two thousand wheelbarrows used for carrying passengers. Carriages and wagons are seldom seen in Chinese cities.

Here is a barber carrying on his business right in the street. People mend shoes and even cook meals in these narrow, crowded streets.

If you are to walk about in a Chinese city at night, it will be well to carry a lantern, for the

streets are dark and dirty. The common street lights are candles placed in paper-covered boxes.

We sometimes travel in ships, but our real homes are upon the land. Many of the Chinese

Fig. 24. — Riding in a Wheelbarrow.

have no homes upon the land. They live on boats or rafts. These floating homes are to be seen along some of the rivers. By means of ropes they are fastened to the banks so that they cannot drift away.

On many of these boats there are tiny vegeta-

ble gardens, and a few fowls. Here children are born, and here they grow up. Just think of spending your life on a boat or a raft! There is no yard in which to play. There is no chance

Fig. 25. — House Boats.

to wander through fields and woods, gathering flowers and nuts.

There is a roof over a part of the boat to keep out the bright sunshine, as well as the rain. See, this little Chinese child is tied to the boat. This will prevent it from falling into the water. There is a child somewhat older with a barrel

about a foot long tied to its back. What can be the meaning of this? We are told that should the child fall overboard, the barrel will keep it from sinking.

It is said that there are one hundred thousand people in the city of Canton living in these house boats. Look at the map of China and find this city.

FILIPINO HOUSES

You have heard of the Philippine Islands, I am sure. They are situated thousands of miles to the westward of California, and not far from the coast of China. Although these islands are so very far from us, they belong to the United States.

In that land there are many cone-shaped mountains called *volcanoes*. At times fiery streams of molten rock pour down their slopes, destroying everything in their path, while the air is filled with bits of rock and dust hurled from their tops, and dense clouds of vapor form above them.

At such times, as well as at many other times, *earthquakes* shake the region. So violently does the earth tremble, that trees sway to and fro, buildings rock, and often fall to the ground, while the people flee in terror.

You must not think, however, that there is

nothing pleasant or beautiful on these islands. There are many things in that distant land with which you would be delighted. The Filipino children never wear mittens, and they do not skate nor ride in sleighs, for it is always summer where they live. At all times of the year the sun is almost directly overhead, for the Filipinos live in the torrid zone. The warm sunshine and the abundant rainfall produce great forests. Mountain and plain are covered with trees and plants such as most of you have never seen except in greenhouses. Great forests, in which the vines and creepers form such a tangle that it is almost impossible to walk through them, stretch for miles.

In the cultivated portions of the country there are fields of tobacco, sugar cane, and rice. Most of the Filipino children can pick bananas from the trees whenever they want them, while over many homes the cocoanut tree waves its graceful leaves.

The Filipinos have dark skins and black hair. Their food, dress, homes, and language differ from yours in many ways. Some of the people

in that land are savages, and roam through the forests almost as animals do. They build no homes, and many of them have never seen a white person. Many of the Filipino children, however, go to school as regularly as you do, for there are a large number of American teachers on the islands.

Probably you have seen bamboo used for fishing rods, but I presume that you would be surprised to see people using these slender poles in building their homes. The Filipinos use them in just this way, however.

Bamboo is really a grass, yet in that land it sometimes grows to a height of fifty feet or more, and it may be six inches in diameter.

A Filipino home is very different from yours. The houses are low, being seldom more than one story in height. The buildings rest upon four or more stout posts set firmly in the ground, the floor of the house being five or ten feet above the surface. If you were to enter one of these houses, you would do so by means of a short ladder instead of by a flight of steps. Do you wonder why people live in this way? It is

because the ground is so damp. In the open space beneath the house, hogs, chickens, and tools are kept. The framework of the house is made of pieces of bamboo fastened together by means of rattan. You can see that the Filipino car-

Fig. 26. — Filipino Homes.

penters do not make as much noise as our carpenters do, nor do they leave as many nice blocks about the new buildings.

Often the walls of the houses are made of nipa palm. The walls are really nothing but mats made of nipa. When a man wishes to build a

house, he can make or buy as many of these mats as he needs. There is no danger of breaking the windows in such a house, for they are simply openings cut in the walls. Often there are shutters of nipa which may be raised or lowered.

The Filipino does not shingle his house as we do, but you must not think that it has no roof. The roof is so well thatched with grass or palm that it will keep out rain for a long time. I must tell you another strange thing about these houses. The roof is made on the ground, and then raised on poles, and set in place. In order to keep the thatch from blowing off, bamboo poles are laid on the roof, and are tied down.

Let us enter one of these houses. We climb up the short ladder, and walk in. The house consists of but one room. There are many houses like this one, but some contain several rooms. In one corner of the room we see a bed of hardened mud; this is not to sleep on, but it is the place on which the cooking is done. As there is no chimney, the walls of the house are covered with soot.

You are wondering where the furniture is.

These people do not think it necessary to have much. Those mats spread on the floor are the beds. The table is of bamboo slats, and see, tied to one of the legs is a game cock. Through the spaces between the slats which form the top of the table, bits of food fall to the floor, and so the game cock does not go hungry. The floor is not solid as it is in your home. It, also, is made of bamboo, placed with the rounded sides up.

Such homes as this one are easily made, and are very cheap. You would not want to live in one of them, I am sure, but the Filipino people seem perfectly satisfied with them. Many of the people do not know that there are homes of a better kind. Houses of this kind do not last very long. Many are destroyed by earthquakes such as I have mentioned. In the late summer and fall terrible winds, called *typhoons*, sweep over the islands, uprooting trees and tearing down houses. In our country we call such storms *hurricanes*.

Like China and Japan, the Philippine Islands produce a great deal of rice. The plowing and

cultivating are done by means of a water buffalo or *carabao*. This is a large awkward beast with flat horns about half a yard long. Usually the ground is covered with water when the plowing is being done, and when the men sow the seed,

Fig. 27. — A Filipino Village.

they wade in the water. Plowing and cultivating the rice fields is not the only work which the water buffalo do. They take the place of horses in drawing loads on carts. When not in use, they spend their time in lying in pools of muddy water.

Now that we have seen something of the country, let us visit *Manila*, the largest city on the islands. Manila is built on both sides of a river called the *Pasig*. On one side of the stream is the old city. Here the houses are built, and the people live, much as they did three hundred years ago. On the opposite side of the river is the new city. This is much more like a city in our own country than is the old one. The houses are much better than those in the country, but they are seldom more than two stories high. Some of the buildings are of wood and some are of stone. On many of the older houses we see roofs of tile, but corrugated iron is used a great deal now. Roofs of this sort are not likely to fall off when earthquakes occur.

Even in Manila the dwelling houses seldom have windows of glass. Instead, shells are used. About two hundred and sixty small shells are used in a single window. The shells are not transparent, but they admit a soft light which is very pleasant. In these city houses there are beds, but they are often of bamboo. You have seen cane-seated chairs. The mattresses

used on the beds are of just such material. The legs of the beds are placed in basins of water in order to prevent centipedes, ants, and other creatures from crawling up. A sort of roof is attached to the high bedposts, and over all a large piece of mosquito bar is stretched.

In the homes of the wealthy Filipinos there is rich and costly furniture. The floors are of hard wood, and are beautifully polished. There are musical instruments, pictures, books, and such comforts and conveniences as are found in the best homes in our own country.

IN THE LAND OF COCOANUTS

If you were to sail southwest from the city of San Francisco for a distance of about four thousand miles, you would reach the land of cocoanuts. On all sides of the Samoan Islands stretch the blue waters of the great Pacific. From the fleecy clouds about the mountain tops, to the foam of the waves along the shore, the islands are dressed in a mantle of green. Winter never puts the laughing streams to sleep in this land, nor spreads his spotless robe of ermine over all, for here summer is always queen.

There are several islands, but if they were all united in one, the area would be but a little greater than that of our smallest state. Can you name it? In ages past, these peaceful sunny slopes were rudely shaken, while fiery streams of lava flowed down them, and volcanic dust and ashes settled upon the land.

But now on every hand we see palms with their

fanlike branches, ferns of various kinds, the cacao, breadfruit, banana and cocoanut tree. The cocoanut palm is one of the most beautiful of trees. It seems to love the restless ocean, for it always grows where sea breezes may play among its graceful, feathery branches. Many of the cocoanuts sold in our cities come from these islands.

This is a land of contentment. Food is easy to obtain. The Samoans do not need to prepare for cold weather, for, as I have told you, they have no winter. There is no need of working from morning until night, so these island dwellers find plenty of time to rest in the shade of tropical trees, to swim in the clear waters of the ocean, and row over them in their canoes. They wear little clothing, and that of the lightest weight. Their brown skin glistens, for one of their curious customs is to rub their bodies with oil.

Here are some native Samoan houses. As you see, they are made of grass and are cone shaped. Some of the houses are thirty or forty feet in diameter. Posts about six feet in height are set in the ground, in the form of a circle, and grass is

woven about them. This forms the walls of the dwelling. In the center of the house is a post much taller than the others. It may even be a breadfruit tree.

Fig. 28. — A Samoan Feast.

The most important part of a Samoan house is the roof. It is made by laying poles from the wall posts to the central pillar. No shingles are laid on the roof, but it keeps out the rain, for it

is carefully thatched with the long leaves of the sugar cane. Branches of the cocoanut palm are used to fasten the thatch in place. Such a roof will last for several years. You would think it odd indeed to see a family, when moving, take the roof of their house and leave the house behind. Our friends in Samoa sometimes do this.

A native house is but one story in height, and it usually contains but one room. See the curious little windows the houses have. They are simply openings which may be closed by grass, woven like that in the wall. The woven grass, mat-like in appearance, takes the place of glass. It hangs down on the wall during sunny weather, but when clouds darken the blue sky, the Samoan prepares for rain by fastening it across the window opening.

Mats are the most valuable pieces of furniture in this, as well as in many other dwellings, and some of them are very expensive. They take the place of beds and chairs. What curious pillows these are! They are simply pieces of bamboo raised on short legs. Here are cups, pails,

and other utensils made of the shells of the cocoanut. Are you wondering where the stove is? That hole in the earth just outside of the house is the stove.

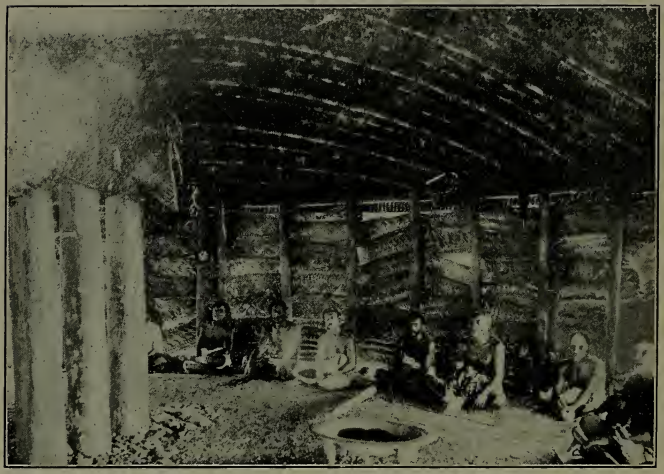

Fig. 29. — Interior of a Samoan Home.

The building of a house in Cocoanut Land is not a very serious undertaking. In fact, it is frequently a sort of wedding celebration. When a newly married couple wants a home, the relatives and friends help them build it. With shouts and gay laughter posts for the walls and poles for the roof are collected. Grass, sugar cane, and

palm leaves are brought. The roof poles are fastened to the posts by means of the fiber of the cocoanut palm. No painting, plastering, or papering is done, and the house is quickly completed.

LIFE IN A LOG HOUSE

The bright September sunshine was filtering through the branches of the trees and falling in golden patches upon the leaves, as a heavy wagon, covered with white cloth, and drawn by oxen, came to a stop on the bank of a river in northern Indiana. In the wagon was a family of pioneers. For weeks they had traveled over mountains, through forests, and across prairies, and now at last they had reached the spot which was to be their future home.

You may be sure that the parents, as well as the children, were happy to reach the end of their long journey. All helped in arranging a camp, for they could have no other shelter than that afforded by the covered wagon, until the father could build a house.

There were neither lumber nor brick yards in the vicinity, for this was in the year 1805, just a century ago. The country was new, and Indi-

ana had not yet been made a state. The house must be made of logs, so Mr. Harrington went into the forest, the edge of which was but a few rods away, to cut down trees. Hour after hour and day after day his ax rang out, while occasionally a forest giant fell to the earth with a crash.

Wilber and Annette enjoyed these bright autumn days. They gathered cat-tails, rushes, and great bunches of golden-rod. They found clumps of hazel-nut bushes, tall hickory trees with their rough bark, and walnut trees with widespreading branches. When at the bidding of the frost the forest trees put on their brilliant autumn dresses, the children were as busy as the squirrels, gathering a supply of nuts for the winter.

Wilber liked to watch his father cut down the trees, trim off the limbs, cut the trunks into logs of the required length, and notch the ends. When the logs were all prepared, they were one by one dragged by the oxen to the place where the house was to stand.

There were a few settlers scattered along the

river, the nearest a mile away, and the men now came to help Mr. Harrington *raise* the new house. A *raising*, which was quite an event in those days, meant putting up the walls of the house, and raising the rafters over them.

Two logs were placed on the ground, notched sides up, parallel, and as far apart as the house was to be wide. Next, two logs were placed notches down, across the ends of the first two, so that the notches fitted together. This was repeated again and again, until at last the walls were of the required height. The gables were made by building the end walls higher than the side walls. The logs were laid one upon another, each being shorter than the one just below it. The ends were cut slanting on the upper side, and the logs were fastened together by means of long wooden pins driven into auger holes. Now poles were

Fig. 30. — The Home of Wilber and Annette.

raised above the walls, forming rafters, and wooden pins were used in these also.

The raising was completed before dark, and as Mr. Harrington could do the remainder of the work without help, his kind neighbors, after a hearty supper, started homeward. *We* employ carpenters to build our houses, but the pioneers, you see, were their own house builders.

"When can we move into the house?" asked Mrs. Harrington the next morning. "Just as soon as I can put the *shakes* on the roof," replied her husband. The shakes were made by splitting short sections of logs into thin boards. They were used as we use shingles now.

The first night after moving in, the family was obliged to sleep on the floor of rough boards, for there were no bedsteads. Mr. Harrington did not go to a furniture dealer as we would do, but built them himself. They could not be moved from place to place as yours can be, for they were nailed to the walls in the corners of the rooms. Indeed the walls formed two sides of each bed, while the other sides were made of rough boards. Across the beds, strips of deerskin were fastened

and upon these were placed mattresses filled with dried grass. "Next fall," said Mrs. Harrington, "we will fill the mattresses with corn husks." Wilber's bed was in the *loft.* When *he* went to bed, he had to climb a ladder fastened to the wall.

In the large room which served as kitchen, dining room, and living room, Mr. Harrington built a fireplace of stone, with a great chimney outside of the house. The fire in the fireplace furnished the only means of heating the house, as they had no stoves. Fastened to one side of the fireplace was an arm of iron, so made that it could be swung from side to side. This was known as the *crane.* Attached to the crane were three iron hooks, and by means of these, kettles and pots were suspended over the fire. When Mrs. Harrington wanted to bake, coals were raked out on to the broad hearth, and a tin oven called a *baker* was placed upon them.

During the long winter evenings when the snow lay deep upon the ground, and the wind whistled through the tree tops, the family gathered about the fire. How the burning wood

snapped, and how the flames roared up the wide chimney! Sometimes the parents told stories, and sometimes they helped the children with their studies, for there were no schools in the neighborhood. Wilber used to dread to leave the fire, and climb the ladder to the cold loft, for although the cracks between the logs were chinked with thin pieces of wood and mud, the fine snow often sifted in.

There were no polished chairs, tables, or dressers, in this log house. All of the furniture was rough and was made by Mr. Harrington. There were no carpets on the floors, and no pictures on the walls. The other homes in this, and in many other parts of our country, were much like that of the Harringtons. As I have said, the settlers lived far apart, but they gladly traveled miles in order to help one another. It was a long distance to the nearest town, and visits to it were made only when necessary. The whistle of a locomotive was never heard, and there were no telegraph and no telephone lines. There was no public library, and there were neither magazines nor newspapers in the

home. The children never turned on the gas nor the electric light, for their only artificial light was furnished by tallow candles. Water could not be obtained by simply turning a tap, but was carried in pails from the spring, a few rods from the house.

How would you like to live in such a home as that of Wilber and Annette? I am very thankful that you have the countless comforts and opportunities that you now enjoy, but I want you to know something of the hard work, courage, perseverance, and suffering, which these cost. For many of the blessings which we now enjoy, our thanks are due the brave pioneers who settled in the wilderness. Do not forget that some of our most useful and noble men and women lived in log houses.

LUMBERING

HAVE you ever spent a vacation in the woods? Have you wandered through them in the spring in search of buttercups, anemones, and honeysuckles? Have you gone blackberrying in the summer? Have you gathered bright-colored leaves, and nuts in the fall? If you have done these things, I am sure that you love the trees.

The breeze is the playfellow of the trees. He knows them all by name. He rustles the leaves of the hickory, oak, maple, and elm. He sighs, and sings among the slender, dark green needles of the pine trees. The long feathery branches of the cocoanut and date palm bow gracefully as he passes among them.

In some parts of the world there are great *prairies*, where one may travel many miles without seeing a tree; while in other regions dark forests stretch for hundreds of miles. Can you give a reason for this?

We love the trees because of their beauty, and because of the peace and enjoyment which they offer. They are of great benefit to us in other ways also.

Fig. 31. — In the Forest.

The forests furnish us with a large part of the material which we use in building our houses. Just think of the long rows of wooden buildings which you have seen in the city. In the country, too, there are many houses and barns built of lumber. The work of cutting the trees and changing them into timbers, boards, shingles,

and laths, is called *lumbering*. I am going to take you with me on a visit to a lumber camp.

You know that some trees drop their leaves every autumn. These are called *deciduous* trees. Other trees remain green all of the year. These are *evergreen* trees. Both deciduous and evergreen trees furnish lumber. How many of each kind can you name? In our country the pine, spruce, hemlock, and fir produce most of the lumber for building homes.

When the frosts of autumn are painting the leaves of the oak, maple, and hickory in yellow, crimson, and gold, the work in the lumber camp begins. These lumber camps are far from towns. There are many of them in northern Maine, in Michigan, Wisconsin, Minnesota, California, Oregon, and Washington. Locate these states on the map. Here in the logging camp we find three large buildings made of rough boards. This one is the blacksmith shop, where the horses are shod, and the tools are repaired. That building just beyond is the *mess house*. It is the boarding house of the lumbermen. You will not find fine linen, silverware, and cut-

glass on the table. The men use tin plates and cups, and steel knives and forks. There is plenty of food, but it is plain.

Fig. 32. — A Logging Camp.

Now we will step into the *bunk house.* This is where the men sleep. The house, you see, consists of one large room. A wide shelf running around the walls is partitioned off into spaces

called *bunks*. Sometimes there are two rows of them, one above the other.

After supper the men gather around this great stove in the center of the room. For a short time they tell stories and sing songs. They

Fig. 33. — The Fall of a Giant.

begin their work very early in the morning, and so they do not sit up late.

The first thing done in the fall is to form the camp. Next, roads are laid out. The roads are made from the heart of the forest to some stream, or to a railroad. After the roads have

been graded, and made as level as possible, they are sprinkled. For this purpose a great sprinkling cart is driven over them. After the water has frozen, more is put on. Sometimes there is a layer of ice on the road more than a foot thick.

The workmen now attack the trees with axes and saws. There is a forest giant nearly ready to fall. A man is driving wedges into the cut in order to make the tree fall in a certain direction. See, it is beginning to totter. The workmen give a shout of warning. With a terrible crash the great tree falls to the ground. What a short time it took the men to cut it down! It has been growing for a hundred years.

Now the workmen are cutting off the branches. They are not valuable for lumber, and it would be difficult to move the trees if they were left on.

Here are men loading logs on to sleds. To do this requires much skill, for the logs might do great damage if they rolled off. Those heavy chains are used to bind the logs to the sled. Each teamster is anxious to haul a larger load than do his companions. Day after day the work goes on. After each heavy storm a snowplow

must be run over the roads to scrape the snow from the ice.

As spring approaches, great piles of logs accumulate along the banks of the stream. When the sun unclasps the icy fingers of the frost king, these logs will be rolled into the water. The stream will carry them to the saw-

Fig. 34. — Loading Logs on Sleds.

mills far below. The mills are often located on falls or rapids. Why? Bangor, Auburn, Lewiston, and Augusta in Maine, and St. Paul in Minnesota, are so located. Find these places.

Here are men marking the ends of the logs before they are rolled into the stream. With their axes the workmen cut out letters and

figures of various kinds. Several lumber companies float their logs down this stream, but each company can pick out its own logs by means of its mark. Marking the logs is a little like branding cattle, you see.

The logs do not float to the sawmills without any stops. They lodge against rocks, and they strand in shallow water. In order to keep them moving as fast as possible, men called *drivers* follow them downstream.

Driving is exciting and dangerous work. The men are armed with long poles. In one end of each pole there is a strong iron hook, by means of which the logs are pulled and pushed about in the stream.

See! There is a driver actually riding on a log as it floats down the river! Now he springs from that one to another. How can he keep his footing? If you were to ask him, he would tell you that in the soles of his shoes there are sharp iron spikes which prevent him from slipping.

Here is a place where some logs have lodged. How rapidly they collect! On they come, one

after another, and crowd against the upper side of the pile. Such a collection of logs is called a *jam*.

Fig. 35. — A Jam.

Now the drivers will have a hard piece of work. They must break up the jam as soon as possible. They wade out into the icy water, and clamber over the jam. Presently they find the particular logs which are holding the rest back. They pull

at them with their hooks, but cannot loosen them. The pile is growing every minute. Something must be done at once, so some dynamite is exploded in the pile. With a great roar the

Fig. 36. — Logs going up Incline to Mill at Vicksburg.

jam breaks up, and the logs start again on their journey.

Near the sawmills are places where the logs are collected and sorted. These are called *booms*. The logs are driven into a body of water joining

Fig. 37. — A Log with One Slab taken off ready to be turned on Car.

the mill, and then floated, one at a time, through a narrow channel from which they are carried by machinery to the great hungry saws.

One end of the log is pushed against a saw which rapidly cuts its way to the other end.

Fig. 38. — Squaring a Log.

The bark and a little of the wood is removed. This, you see, makes the log flat on one side. The log is then turned and cut on another side. This process is repeated until the log is a great square piece of timber. It is then sawed into

smaller timbers or boards. The slabs cut off to square the log are used in making lath.

The lumber must now be shipped to the parts of the country where it is wanted. Sometimes ships can go up the rivers to the places where the sawmills are located. When they cannot, the lumber is shipped by rail.

Fig. 39. — Ships unloading Lumber.

Chicago is the greatest lumber market in our country. Indeed, there is none larger in the whole world. Great shiploads are sent from the pineries near Lake Superior and the northern part of Lake Michigan. Locate Chicago, and the lakes of which I have spoken.

The lumber district in Chicago is a very inter-

esting place to visit. There are narrow streets on each side of which the lumber is piled high in long rows. Here much lumber is placed on cars, and sent to smaller cities and towns.

You know that trees contain a great deal of sap. Where do they get it and how? When a tree has been cut into boards, they should be allowed to dry before being used. In the lumber yards the boards are piled so as to allow the air to circulate between them. Sometimes the boards are dried by means of artificial heat. This takes about a week only.

When the saw cuts out a board, it is rough on both sides. You know that many of the boards that we use in building houses are smooth on one or both sides. Smoothing the boards is called *planing*. Have you ever seen a carpenter planing a board? Most of the planing is done in planing mills. When a board is to be planed, it is run between two rapidly revolving rollers. These carry it to the planes. After being planed it passes between other rollers. As it comes out, it is placed in a pile.

There are great forests on the Pacific coast. There the trees are very large. In much of that region there is little snow, so of course the trees are not hauled on sleds. Great logs are laid on the ground in two parallel lines like the rails

Fig. 40. — Logs in a Chute.

of a railroad track. Across these, short logs, hollowed out on the top side, are placed.

The logs really form roads, and are called *skids* or *chutes*. Logs are placed on these, and dragged to a sawmill, a train, or some river.

Many logs are floated down the Columbia River, and some great rafts of logs are floated to San Francisco.

In northern and central California there are forests of redwood trees. They average three

Fig. 41. — Cutting a Redwood.

or four feet in diameter, while some are even fifteen feet.

When the men cut the very large trees, they do not stand on the ground, but on a platform from four to ten feet high. They do so because

the lowest part of the tree does not make very good lumber.

There are few streams in that region large enough to float such great logs. On this account the sawmills are often in the forest close to

Fig. 42. — A Train Load of Logs in the Sierras.

where the trees are cut. The logs are generally loaded on to cars by means of donkey engines.

In some parts of California, the timber is cut so high up the mountain slopes that it can be reached neither by railroads nor wagon roads.

It is sent to the valleys below in a very curious way. A great strong trough of wood is built in the form of a letter V. It is called a *flume*. A stream of water is turned into the flume. The boards are dropped into the water, and are

Fig. 43. — Boards ready to be Flumed.

carried down very rapidly. In Fresno County there are several flumes, each of which is more than forty miles in length.

In our Southern States there is still another timber belt. There the yellow pine is the most

common lumber tree. There are nearly ten thousand sawmills in the Southern States. Pensacola and Mobile are important lumber-exporting cities. Can you find them on the map?

Fig. 44. — Boards going down a Flume.

You see how important our forests are. If we are to have homes built of lumber, we need the help of many men, for we cannot go to the forest and get it. Name the different kinds of work necessary.

We have a great deal of timber in our country to-day, but it will not last always. The trees are being cut very rapidly, and many are destroyed every year by fire. We should take great care of our forests, and plant trees where others have been cut. Unless this be done, there will be little timber left when you are grown.

HOW BRICKS ARE MADE

In nearly every city there are long rows of brick buildings. Some of these are dwelling houses occupied by a single family, some are tenement houses in which many families live, while others are hotels or business houses many stories high.

Here by the roadside is some damp *clay*. It clings to our shoes. See how the wheels of the wagons roll it up as they pass along. Take a bit of it in your hand; you can mold it into any form you wish. It is from material such as this that the brick for our buildings is made.

Thousands of years ago the people of Egypt, Assyria, Babylonia, and other eastern countries, molded clay into bricks and dried them in the sunshine. Bits of grass or straw were mixed with the clay to bind the particles together. There was little timber in these countries, but there was plenty of clay. The climate is so dry that

some of those ancient bricks have been preserved to this day.

In Mexico, Arizona, California, and other parts of the West, there are many dwellings

Fig. 45. — An Adobe House.

made of sun-dried bricks. Such homes are called *adobe* houses. Most of them were built when lumber was more difficult to obtain than it is to-day, but many of them are still inhabited.

Most bricks are now made by machinery. In order to understand how the work is done we

will visit a brickyard. The process is carried on in somewhat different ways in different places, yet it varies little throughout the world.

As we approach the brickyard we see several tall chimneys rising above long, low sheds. We see men and boys moving to and fro, carts drawn by single horses, and as we come nearer we hear the sound of machinery.

Here men are plowing. This loosens the clay so that it can be taken up in scrapers. We follow one of the scraper loads of clay to the foot of an inclined plane on which there is a track. A bridge is built over the track at the lower end. Directly beneath a hole in the middle of the bridge is a small car. The team draws the clay on to the bridge; one horse steps on one side of the hole, and one on the other; the scraper is turned over, and the clay falls into the car.

When the car is full, an engine at the top of the incline draws it to the mill. Here the clay is crushed to a powder between a revolving circular platform of iron and two great iron wheels. Any chance stones, as well as the clay, are crushed in this mill.

Fig. 46. — A Car Load of Clay going to the Mill.

In the bottom of the circular platform there are very narrow openings through which the fine material drops upon a wide moving belt. The edges of this belt are higher than the middle; so the clay does not fall off. The belt carries the powdered clay to a box in which there are large iron knives revolving. A spray of water falls constantly upon the clay. The knives mix the clay and water thoroughly. This process is called *tempering*.

From this box the clay is fed into another, at the bottom of which it is pressed into *molds*. Each mold holds six bricks. The empty molds are sanded by machinery; this prevents the bricks from sticking to them. As fast as the molds are filled they are pushed by machinery on to a table. A man with a trowel scrapes off any clay that may be clinging to them, and a second man turns them upside down over wooden trays. These trays are placed on carts and drawn to the drying sheds. Machinery carries the molds back to the press, where they are again filled.

Now let us follow this load of bricks to the sheds. They are in long rows with roads be-

tween just wide enough for the carts. The roofs keep off the rain and the bright sunshine. The trays containing the bricks are placed on frames or shelves. In each of these sheds there are more than ten thousand bricks. In eight or ten days the bricks will be dry enough to move, and they will then be hauled to the *kiln*. Here is a kiln being filled. It is a great oven rectangular in shape, but many kilns are circular. There are three walls of brick, leaving the oven open on one side. Watch, the men are just beginning to fill it. They pile the bricks up in such a way as to leave spaces between them, which allows the heat to circulate freely. When filled, the kilns contain about fifty thousand bricks each.

When a kiln is filled, the fourth wall is built up, and the heat is gradually turned on until the desired temperature is reached. In about four days the heat is slowly turned off, for the bricks must not cool too rapidly. As the cooling also requires about four days, a week or more is needed to complete the process of firing the bricks.

The very smooth bricks, which you have often seen in the front walls of fine houses, are known

Fig. 47. — Filling a Kiln.

as *pressed* bricks. A finer quality of clay is required for these, than for ordinary bricks. When the clay comes from the mold, it is in the form of a long bar. This has the same width and thickness

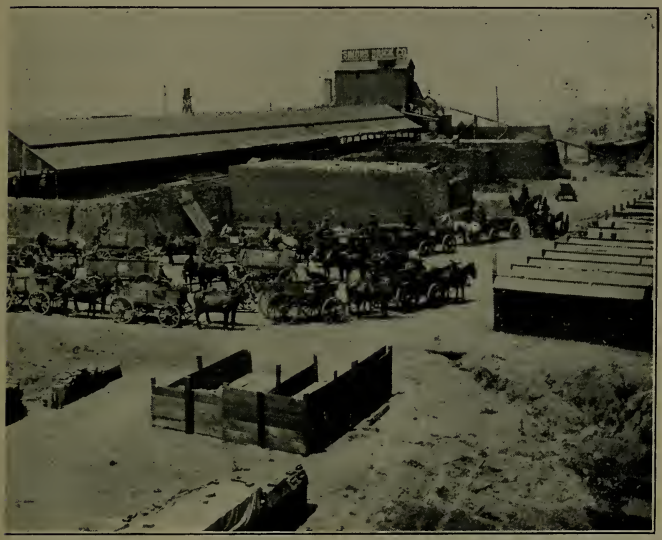

Fig. 48. — General View of a Brickyard.

as a brick, but may be fifteen or twenty times as long. This bar of clay is moved along by machinery to a great wheel or cylinder having wire spokes. The distance between two adjacent wires is equal to the width of a brick. As the

wheel turns, the wires cut the bar of clay into bricks.

The bricks are now carried by machinery to a machine where they are powerfully pressed. They are then loaded on to small cars, and run into a dryer. This is a great metal oven, in which the cars remain for about twenty-four hours, after which they are run into a kiln. The firing requires ten or twelve days.

Pressed bricks are much more expensive than ordinary bricks. This is the reason they are generally used in the front rather than in all parts of a building. Such bricks are of many different colors. The pressed bricks made in Milwaukee are famous for their good qualities.

Bricks are made in many parts of our country, and in other countries as well. In many places they are not made during the winter, because the frost cracks them while drying. In California they are made at all times of the year. Can you tell why? Pennsylvania, New York, and Illinois are the most important brick-making states.

And now we are ready to see how a brick house

is made. Bricks, sand, and lime are drawn to the spot where the building is to stand. Of course it would not do to make walls of loose bricks. They must be held firmly together, and for this purpose *mortar* is used.

Here is a workman putting lime into a great box. He puts into the box two or three times as much water as lime. Then he puts in sand that has been screened, and with a large hoe he mixes the sand, water, and lime so thoroughly that the three substances are combined in one. The clothes of the workman are covered with white spots, for the mortar spatters as he works it. Now all is ready for the helpers who carry mortar and bricks to the bricklayers. The bricks are laid in a thin coating of mortar. The workman lays several bricks in a row, taps them with his trowel, and scrapes off the extra mortar that clings to them. The mortar between the bricks is called the *joints*. The bricks are so laid that the joints do not form continuous vertical lines. Laying the bricks in this way is called breaking the joints. Is there any advantage in breaking the joints?

As the walls grow, openings are left for the doors and windows. In large buildings the bricks and the mortar are carried to the upper stories by elevators or by means of ropes and pulleys.

Fig. 49. — Early Home of Longfellow.

The interior of a brick building is finished about as is the interior of a wooden one. Here is a picture of one of the oldest brick houses in the United States. It is in Portland, Maine. It was built in the years 1785–6. The early life of Henry

W. Longfellow was passed in this house. Name some poem written by Longfellow. Although the building is not very large, the workmen were nearly two years in making it. Would you not like to see this old house?

HOUSES BUILT OF STONE

Houses made of wood do not last very long. The lumber slowly decays on account of exposure to the weather. Many wooden buildings are destroyed by fire. There are few wooden houses more than one hundred years old in our country. Stone is a very durable building material. When exposed to the weather, it decays much more slowly than does wood. Animals do not bore into it as they do into wood. Stone buildings are not destroyed by fire as wooden ones are. There are houses of stone in Europe that have stood for hundreds of years. Portions of Windsor Castle, in which the king of England lives, were built five centuries ago.

Stone is very heavy to handle. On this account it is not shipped as extensively as is lumber. Whenever possible, it is shipped by water, as it costs less to ship material by boat than by train. There are many kinds of rock, but only a few are

used in building. The most important are granite, sandstone, limestone, marble, and slate.

The work of digging the stone from the earth is called *quarrying*. Quarrying is expensive work, for the great blocks of stone cannot be handled without machinery. Sometimes the

Fig. 50. — Windsor Castle.

stone is found at the surface of the earth, and sometimes it is far below the surface. Stone quarries are not as deep as some coal mines, however. There are more than five thousand stone quarries in our country, and they furnish work to about seventy thousand men.

You have heard of the "granite hills of Maine," and you know that New Hampshire is called the "Granite State." There is much granite in other New England states, as well as in many other parts of our country.

Granite was once in a melted condition. It was forced up from within the earth when in this state, and was afterward cooled and hardened. Granite is very hard and will sustain a great weight. It does not weather easily, and it takes a good polish. Because of these qualities it is used very extensively in building.

Some of the granite quarries of New England are located on small islands near the coast. Many of those on the mainland are not far from the water. This makes shipment cheaper than it would otherwise be.

Granite is not found in layers as sandstone and limestone are. It can, however, generally be broken along lines known as *joint planes*. Holes are driven into the rock a few inches apart. Sometimes powder is placed in these holes, and the rock is *blasted*, but generally iron wedges are driven into the holes, and the blocks of rock are split off in this way.

See, those machines lifting the great blocks of stone are called *derricks*. How easily they raise blocks that weigh many tons. The steam or electricity which works the machinery has greater strength than any giant in old-time fairy tale. *Cranes* swing the blocks around and lower them on to a vessel or a car. The same giant who works the derrick is laboring here, too. The blocks of stone are smoothed by means of chisels. If columns are wanted, they are turned in a lathe as is wood. Hard as this rock is, the polished surfaces are easily scratched. On this account the columns are protected by cases of wood when they are shipped. New England produces more than one-half of the granite used for building in our country.

You are all quite familiar with sand. You have seen it in the streets and in the fields. Every stream, as it journeys on its way to the sea, carries sand. The waves of every lake, as well as those of the ocean, are grinding rock into sand, and hurling the sharp grains against other rocks. The streams, the lakes, and the ocean are wonderful mills, and the sand grains are their tools.

Take a handful of sand, and drop it into a glass jar partly filled with water. When the sand has thoroughly settled, you will find it arranged in layers. Now if you could change these layers into stone, you would have *sandstone*. When the sand which every stream carries reaches the ocean, it settles to the bottom. The water carries a substance to the sand grains which binds them firmly together. It is not glue, yet in Mother Nature's hands it acts as does a magic glue. No man nor machine with all the power and glue imaginable could do this work. Indeed, it depends upon the substance which old Dame Nature chooses as to whether or not the rock will easily crumble or be worn away by running water. Other material is deposited above, so that in time the pressure on the sand is very great. This helps in changing the sand into stone. All of the sandstone that is now a part of the land was formed in this way, and was then very slowly raised above the water. Rock formed in this manner is called *sedimentary* rock.

Sandstone is found in many states, but is

chiefly quarried in Pennsylvania, Ohio, New York, Connecticut, Massachusetts, and California. Locate these states.

The ocean is full of life. Fishes of many shapes and colors swim gracefully about in the gardens of the sea. Upon the rocks are countless animals living within their shell homes. There are other animals, some of them very small, that build outside skeletons. After the shellfish, starfish, sea urchins, and many other animals die, their skeletons are slowly changed into *stone*. We see that even the tiny animals of the ocean furnish us with material from which we build houses.

Limestone, like sandstone, is sedimentary rock. The movements which take place very, very slowly in the rocks of this wonderful old earth, lift some of the limestone above the surface of the water. Limestone is very widely distributed, but it is quarried chiefly in the Mississippi valley. There are many limestone quarries near the city of Chicago. Joliet, not far from Chicago, is nicknamed "Stone City."

Limestone is used for other purposes besides

house-building. Bricks and stone are laid in a material called *mortar*. This same material is used in plastering houses. Mortar is made by mixing lime, water, and sand. If the mortar is to be used in plastering, hair is mixed with it

Fig. 51. — A Limestone Quarry, Joliet, Ill.

also. This holds the particles together. Lime is made by heating limestone in great ovens called limekilns.

When I was a boy, school children did not use notebooks very commonly. Instead, they

Courtesy of the Vermont Marble Company.

Fig. 52. — Marble Quarry at Proctor, Vermont.

used slates. We did our number work and our language work on slates, and handed them in to be corrected. Slates are made from a rock called *slate*. It is composed of fine particles of clay. These have collected on the floor of some body of water, and have gradually been changed into a stone called *shale*. After a time, if there is much heat and pressure, the shale is changed into slate.

Slate can be split into very thin sheets, and on this account it is often used on the roofs of houses instead of wooden shingles. These stone shingles are about one-eighth of an inch in thickness, from three to fourteen inches wide, and from seven to twenty-four inches long. Most of the slate used in our country is quarried in Pennsylvania, Vermont, Maine, and Massachusetts.

Our most beautiful building stone is *marble*. Marble is simply limestone that has been changed by much heat and pressure. It is of different colors, such as white, blue, and green. Marble is very durable, and takes a beautiful polish. Marble statues made hundreds of years ago still delight us with their beauty.

About four hundred years before Christ was born, the Greeks, who loved beautiful things, built the Parthenon of white marble. Beautiful marble has been quarried at Carrara, Italy, for centuries, and some of it has been shipped to America. We now have many marble quarries of our own. Vermont produces more of this stone than does any other state. Find Rutland, Vermont, which is called "Marble City." There are also quarries in Georgia, New York, Tennessee, Massachusetts, and California.

It is said that in 1836, William F. Barnes traded a horse, worth seventy-five dollars, for the land on which the marble quarries at West Rutland, Vermont, are now located. This land is now worth millions of dollars.

At first, quarrying was very slow work. The blocks of marble were hauled by teams a distance of twenty-five miles, but in 1857 a railroad was built to the quarries.

Let us look down into a quarry. This one is about three hundred feet deep. On the floor are machines moving very slowly back and forth. They are called *channelers*. They run on tracks

Courtesy of the Vermont Marble Company.

FIG. 53. — Marble Quarry at Proctor, Vermont.

on each side of which they cut a groove about one inch wide. Sometimes these grooves are cut to a depth of ten feet.

The saws that do the cutting have no teeth. They are of soft iron or wire driven back and forth

Courtesy of the Vermont Marble Company.

FIG. 54. — Marble Quarry at West Rutland, Vermont.

by machinery. Grains of sand are washed into the cut to take the place of sawteeth. The sand really does the cutting; the saws only move it to and fro. The blocks are loosened by driving wedges into holes bored a few inches apart.

Derricks lift the blocks out of the quarries. Cars haul them to the mills, where they will be prepared for use.

Whole buildings are not commonly made of marble. Steps, columns, and fronts, are often of this material. Floors, also, are sometimes made of marble.

A house built of stone means a great deal, you see. It reminds us of the formation of the rock, of the quarrying, of the cutting and polishing, of the shipment, and of the work of the stone mason.

ARTIFICIAL STONE

Probably you have seen many beautiful buildings which were apparently constructed of stone such as is obtained from quarries, but which were really built of stone made by man. Old Mother Nature makes stone very, very slowly. Perhaps she requires thousands of years to form a layer of limestone one foot in thickness. Man can make a block of stone a foot thick in a few minutes. Such material is known as artificial stone, or *concrete.*

Concrete is not a new material, for the Romans used it hundreds of years ago. They did not, however, make the blocks hollow as they are now often made.

In the manufacture of concrete, crushed stone, sand, and cement are thoroughly mixed. Sometimes the mixing is done by hand, but it is generally done by machinery. The crushed stone and gravel form the main part of the mixture. The

spaces between the bits of stone are filled by sand grains, while the particles of cement fill the tiny spaces between the grains of sand. Sometimes the sand to be used is washed to free it from impurities.

The mixture is shaped into blocks in iron molds. These are simply boxes without tops, the sides of which can be raised and lowered by machinery. The molds are, of course, of different sizes.

While one man shovels the crushed material into the mold, another pounds it down with a sledge hammer. When the mold is about half full, a wooden box without ends, and as long as the mold is wide, is placed crosswise in it. The mold is now filled, the material being pounded down as before. When it is quite full, it is smoothed off on the top with a trowel.

One of the workmen now turns a wheel, thus lowering the sides of the mold. Resting on the bottom of the mold is a block of soft, wet stone. It does not seem like stone because it is so soft. This block is carefully tipped over on to a heavy board, and the wooden box taken out. This leaves a hole in the stone as large as the box.

In order that the stone may dry slowly, it is put under a shed, or covered with straw or cloth, and sprinkled frequently for about a week. It is then allowed to dry in the sunshine for several days.

Frequently the blocks of artificial stone are rough on one side, thus resembling natural stone that has been chipped. This effect is produced by placing on the bottom of the mold a form like that desired. The material, being pressed in on top of this, takes the proper impression.

Besides the ordinary building blocks, much ornamental building stone is produced. These ornamental pieces are often used on the fronts of brick buildings. The ornamental work is first drawn, and the drawings then carved in wood. You will be interested in knowing that the carving is done in just the reverse order to that in which it will appear in the stone.

After being carved the wooden models are cut into strips. The strips are fitted tightly together and placed on the bottom of a mold. After the material from which the stone is made has been

pressed on top of the design, the block is carefully turned upside down. Removing the strips of wood is a delicate operation, and requires a skillful workman. The design is now carefully gone over, and all errors or imperfections corrected. The blocks now dry as do the others.

In making the blocks of concrete for a house, each piece is numbered so that the builders may know just where each stone is to be placed. There is no cutting in order to make pieces fit, and there is therefore no waste material.

Artificial stone is stronger than brick, and more durable. As our supply of lumber is constantly decreasing, and as the quarrying and shipment of stone is expensive, concrete is becoming quite important as a building material.

NAILS

What a hammering and pounding goes on while a frame house is being built. Most of it is due to the driving of nails. Without these useful little articles, such wooden houses as many of us live in could not be constructed. The floors, walls, shingles, lath, and other parts of a building, are held in place by means of nails.

To-day nails are very common and very cheap. You know that when your father wants some, he does not need to make them himself. Instead, he buys them at a hardware store. There was a time when all nails were made by hand. What a slow process it must have been. In the city of Birmingham, England, as many as sixty thousand persons were once engaged in this work. As the wages were very low, much of it was done by women and children. In the early days, nail making was carried on in many of the homes in New England. The nails were made from iron

rods which were sold in bundles. Pieces of the right length were cut from the rods, and held in a vise while one end was flattened into a head.

This method would not do at all at the present time. Nails are now made by machinery in great mills. In some places the iron to be used is rolled into thin bars. While hot, these bars are cut into strips each as wide as the length of the nails to be made. A machine cuts the strips into pieces of the right length, and fashions a head on one end of each.

Most nails are not of the kind just described. They are round instead of flat, and are made of steel wire. The wire is in great coils which is unwound by machinery, and cut into pieces. The machine also points one end of each piece, and heads the other. More than a ton of nails is often made by a machine in a day.

Whenever we build a house, we are indebted to the men who are working in the iron mines of Alabama, or of Pennsylvania, or of the Lake Superior Region, for steel wire is made from iron. But these are not the only men who help

us, for the iron ore must be smelted, shipped, and refined.

Many people build houses without the use of nails. The Eskimo uses none in his home of snow and ice. The Indian tepee and the hut of the Pygmy are built without nails. Our Japanese friends sometimes use wooden pegs, and I have told you that they were used in making log houses. In my grandfather's barn, I have seen nails of oak, that had been in use for twenty-five years. Name other things that sometimes take the place of nails.

GLASS

How many beautiful things we see from our windows every day. Probably you have been awakened by the morning sunshine streaming into the window of your room. Perhaps from this same window you have looked out upon garden, fields, or woods, when the whole earth was bathed in soft moonlight. Have you stood beside a window when the warm spring rain was falling, and the apple trees were sending showers of pink and white blossoms to the ground?

It is not chiefly because of the many beautiful things which our windows enable us to see, that they are valuable. Think of living in a house without light. You would not want to endure it for a single day; yet for ages people had no windows in their habitations, and many do not use glass to-day. We need plenty of light in our homes, both for convenience and for health.

I have told you of the Eskimo who uses a piece of clear ice for a window. You remember that in many Filipino houses, small pieces of shell are used. What sort of windows do the Japanese people have?

You may be surprised to learn that sand is used in the manufacture of glass. There is in sand a material called *silica*. This, when fused or melted with soda, and some other things, becomes transparent, and is known as glass. Not all sand is of the right kind for glass making, and on this account the factories are located near the places where the best sand is to be found.

After the sand has been washed, burned, and sifted to remove impurities, it is placed, with the other materials, in a tank inside of a furnace. The temperature in the furnace is sometimes fifty times as high as that of the boiling point of water. Do you know at what temperature water boils?

This high temperature causes the silica and other substances to fuse. After a time the temperature is lowered until the mass is in a pasty

condition. Now a workman sticks one end of a long blowpipe into the glass, and twists it about until a large piece of the paste becomes attached to the tube. Next he places the other end of the pipe in his mouth, and blows through it. As he blows, the mass of glass expands into a pear-shaped body. This he rolls upon a flat piece of marble, and when it becomes somewhat cool, he heats it again, and the process is repeated. Occasionally he swings the whole mass over his head, holding one end of the pipe in his hands.

Gradually the pear-shaped mass changes into a cylinder. It grows until it is about as long as a man is tall, and perhaps a foot in diameter. After blowing again into the pipe, the workman puts a finger over the open end, and heats the glass. The expansion of the air breaks the closed end of the cylinder. By means of a cold iron the glass is cracked where the blowpipe is attached to it, and so separated from it. With a diamond the inside of the cylinder is now scratched lengthwise, and a cold iron is moved along the scratch. This causes the cylinder to crack along the same line. The glass is again placed

in the oven, where it softens and begins to flatten. In order to make it perfectly flat and smooth, wooden tools are used. When this work is finished, the glass is cut into various sizes and shapes by means of a diamond. When curved lights of glass are wanted, blocks of iron of the same shape are used on which to flatten it.

In the year 1608 some glass workers were sent from London to America, and the next year they began to manufacture glass about one mile from Jamestown, Virginia. Now there are about four hundred glass factories in the United States. More glass is manufactured at Pittsburg than at any other city in our country. For what else is Pittsburg noted?

FIRE AND ITS USES

When the biting winds of winter are driving the snow before them, and streams and lakes are sealed with ice, our homes are cozy and warm because of the fires in them. Like many other things that we enjoy, we are so accustomed to fire that we do not realize how much it means to us. It is one of our greatest blessings, however, and without it our lives would be very different from what they now are. If you were in some forest without matches, how would you make a fire, and how would you cook by means of it, if you *did* discover how to make fire? This is a problem which people were a long, long time in solving. How long ago man discovered how to produce fire, and how he came to make the discovery, no one knows. Seeing sparks produced by striking two stones together may have suggested the idea, or rubbing one piece of wood upon another until

they ignited may have led to it. At any rate it was one of the greatest discoveries ever made.

A very old method of obtaining fire is rapidly to whirl a small stick, one end of which is in a hole in a larger piece of wood, between the palms of the hands. Underneath the hole, very fine, dry material is placed. Sometimes fire can be produced by this means in a few seconds, and at other times one or even two minutes are required. Compare this with the time required when a match is used.

Another way of producing fire is to take a piece of bamboo and split it into two half cylinders. Across the edge of one of these the sharp edge of another piece of the same material is rubbed rapidly, very much as one would handle a saw. On this account the process is sometimes called *sawing*.

The Moros, who live in the Philippine Islands, carry their fire-making apparatus, which consists of a piece of bamboo, a bit of china, and some tinder, in a case of bamboo. When fire is wanted, the bamboo is held in the left hand in an upright position, while with the right, it

is struck slanting blows with the china. In this way sparks are produced which light the tinder.

No doubt you have seen sparks fly from beneath the feet of horses when they were traveling on a stony road, or on a paved street. Sparks may be produced by striking a piece of flint against a piece of rock containing iron. By carrying pieces of these rocks with them, people had a means of making fire. This led to the use of the flint and steel, which were found in the homes of the early settlers in this country.

In order to make the starting of the fire as easy as possible, some very dry material called *tinder* was carried in a small tin box called a tinder box. Sometimes small pieces of wood called *spunks* were carried in the box. These were tipped with sulphur, and the sparks would light them quite readily. When men went on a journey, they carried the flint, steel, and tinder in a bag of deerskin.

You can see from this how difficult it was to obtain fire in the past. It is no wonder that some people worshiped it, and that fires were kept burning for months and even years at a

time. Some of the Indians used to bury the fire-making apparatus with their dead, for they believed that they would need it in the life to come.

In early times people naturally used wood as a fuel, as it was found in so many places, and burned readily. Partly because of the need of fuel, people followed streams when traveling in a prairie country. Why is timber usually found along rivers?

Primitive people built their fires on the ground, sometimes inside the tent or hut, and sometimes outside. These fires took the place of stoves, and here the cooking was done. At night all sat around the fire while the burning logs snapped, and the smoke and flame rose upward into the tree tops. What strange shadows danced among the trees, and upon the surface of the stream just beyond the firelight. When the fire got low, the shadows crept closer to it, and when it brightened up again, they retreated. Even more wonderful were the things seen in the fire itself. Birds and animals, and human forms and faces, appeared and disappeared in the changing fire-

light. It is no wonder that the children of the forest were superstitious.

By and by people improved upon the camp-fire by building the fireplace and the chimney. This made it possible to have a fire in the house without smoke, and it also made cooking much easier. The fireplaces were so deep and wide that very large pieces of wood could be placed in them. Often the fire would last all night.

It is not very long since stoves came into general use. At first many people were afraid of them, but they soon saw their great value. A stove requires much less fuel than a fireplace. It gives out more heat, and is very much more convenient for baking and cooking.

In time man found that coal, which was once wood, could be used as fuel. This was very important, for coal lasts longer than wood, makes a hotter fire, and is found in many places where wood is scarce. The use of coal makes it easy to heat large houses by means of furnaces. In another place I will tell you about the formation and mining of coal.

When your great-grandfathers were patiently

making fire by means of the flint and steel, they did not dream that you would be able to produce a hot fire in an instant by simply igniting a stream of gas. No carrying of wood or coal, no arranging of kindling, no emptying of ashes, yet many men work in various ways, and in various places, in order that you may be able to enjoy this wonderful fire.

Wood, coal, and gas are not the only kinds of fuel used. Name others with which you are familiar. In Iowa and Nebraska bright yellow ears of corn are sometimes burned. Little timber grows there, and when corn is very cheap, it does not pay to ship it to market. In China the very poor people collect weeds in the fields, and by the roadsides, which are dried and used as fuel. The kind of fuel used depends largely upon what can be obtained most cheaply. What do you burn in your home, and where does it come from?

A fire is one of the most important things in a house. How comfortless a home would be without one in winter. When people are shivering with cold, they find it very difficult to read,

study, sew, or do many other things. Much of our civilization is due to fire. When man is without fire, he must eat his food raw as savages do. This is both degrading and unhealthful. Because of fire it is possible to take long journeys into regions where food cannot be obtained, for cooked and canned food can be preserved for a long time. I think you will agree that fire is one of our greatest blessings.

HOW COAL IS MADE AND MINED

The air was filled with whirling, dancing snowflakes. All day they had been fluttering down from the gray sky. They spread a soft white mantle over the fields, hiding all of the rough places. The apple trees, stretching out their leafless branches, looked dim and shadowy.

Uncle George laid down his book and put a fresh supply of coal in the grate. Then he looked out into the blinding storm. "I declare," said he, "I hope that everybody in the village has coal enough to last until this blizzard is over. It would be rather serious to be without fuel just now."

"Where does our coal come from?" asked Herbert.

"*This* coal came from the eastern part of Pennsylvania," replied his uncle, turning to a map which hung on the wall. "It is called hard or *anthracite* coal. Most of it is shipped from the

cities of Wilkesbarre and Scranton. Soft or *bituminous* coal is mined in many states."

"How is coal formed?" asked Foster.

"Long ages ago," said Uncle George, "this country looked very different from what it does to-day. There were great marshes and swamps where now there are none. In the marshes were gloomy forests. There were ferns many feet in height. Great vines stretched from tree to tree, and creepers covered the ground. No human eyes ever saw these dark forests, with their thick undergrowth, for man had not then appeared upon the earth.

"As the trees and other plants died, they fell into the marshes. In time a great deal of vegetation accumulated. Gradually it was covered with mud brought to the marshes by the slowly flowing streams. The mud pressed upon the vegetation and hardened it somewhat. In this way it was changed into a substance called *peat.*

"There is peat in the old marsh on the north end of the farm," continued Uncle George. "Many extensive peat beds are found in our

country, in Canada, Ireland, Sweden, Russia, and other parts of the world."

"Is peat used for anything?" asked Foster.

"Yes," replied his uncle, "peat is used as a fuel. Many people in Ireland burn nothing else. The peat is cut out of the bogs in blocks. They are then dried and sometimes pressed. As the peat is obtained near the surface of the earth, it is not very expensive to dig it.

"The layers of mud which bury the peat deeper and deeper in the swamps, change it more and more. In time it becomes a very soft brown coal called *lignite*. The next step in the process of coal making gives us the common soft coal called *bituminous*. After this comes *anthracite* or hard coal."

"Does it take a great deal of vegetation to make a ton of coal?" inquired Herbert.

"Yes," answered Uncle George. "Perhaps it took a layer of vegetation more than one hundred feet in thickness to form a layer of coal six feet thick.

"During the coal age there were many changes in the land. Sometimes the water was quite

deep in the marshes. Then much sediment was brought in by the streams. At other times the marshes were very shallow, and a great deal of vegetation grew in them. In time the sediment became *rock*, and the vegetation was changed into coal. Therefore the miners find layers of coal between layers of rock.

"This bright, shining coal, you see, is simply vegetation which grew long ages ago. Sometimes the imprint of a leaf may clearly be seen in it. In some places miners find stumps of trees which have been changed into coal."

"Have people always used coal as fuel?" asked Foster.

"No," replied his uncle. "It has been used but a few hundred years. At first many were afraid to burn it."

"I don't see why they were afraid," said Herbert. "Perhaps they thought that it would explode," said Foster.

"It was thought that the smoke poisoned the air," said Uncle George. "Indeed, King Edward I of England ordered that all buildings from which coal smoke was seen to issue, were to be destroyed.

He even made the burning of coal an offense punishable by death.

"In time this foolish order was changed, yet people were not free to do as they wished. In the great city of London coal could not be burned during the time that Parliament was sitting. Many of the members came from the country where coal was not used, and it was thought that the smoke would make them sick."

"I know where London is," said Foster, pointing to it on the map. "It is the largest city in England," added Herbert.

"Yes," added Uncle George, "and it is the largest city in the world.

"These ideas about the use of coal seem very strange to us. There were many others equally strange. For a long time the ladies who belonged to the higher classes of society in England refused to enter homes in which coal was used. Many would eat no food cooked by means of it.

"Coal was first mined in our country about one hundred years ago. In 1814 twenty-two tons of anthracite coal were produced in Pennsylvania. In 1822 the mining of bituminous coal began."

"I wish that I could visit a coal mine," said Herbert. "It must be fun to work in one," put in Foster.

"Coal mining," replied their uncle, "is both hard and dangerous work. It is anything but pleasure, you may be sure. In our country alone, about five hundred thousand men and boys spend a large part of their lives in deep, dark mines. They have much less time than you have to enjoy the sunshine, flowers, brooks, trees, and birds. These workers supply us with coal. We use it in our homes and factories. It carries us across continents and oceans.

Fig. 55.—A View in a Coal Mine.

"The work of coal mining is carried on in

different ways," continued Uncle George. "In some places streams have cut their channels close to the layers of coal. A horizontal tunnel called a *drift* can then be cut from the valley into the earth, where the coal is deposited. The coal can then be brought out through such drifts.

"Where the coal is very deeply buried, this cannot be done. An opening must then be dug from the surface straight down to the coal. Such an opening is called a *shaft*.

"When the shaft reaches the coal, the miners cut horizontal drifts as they follow up the seams of coal. In a large mine there are many miles of these tunnels.

"To enter such a mine we must climb into a sort of elevator called a *cage*. Down, down the dark shaft we go, finally reaching the bottom. At first we can see nothing clearly. Flickering lights are moving about. We see shadowy forms that seem to be far off, and we hear strange noises.

"The lights are small lamps worn on the caps of the miners. Without these, they could not see to work in the narrow, dark passages.

"There is in mines a dangerous gas called *fire damp*. When this comes in contact with a flame, an explosion follows. On this account a small metal case surrounds the flame of each lamp. You see the small holes through which the light comes.

"Look at this man. The chamber in which he is working is so small that he must lie on his side as he works. By means of an iron rod called a *drill*, he makes holes in the sides and roof of the chamber. In each hole he places a cartridge. A fuse is lighted, and now we hear the cry of 'Fire!' Everybody hurries to a place of safety. Soon there is a loud explosion, shaking down rock and coal from the roof and walls of the chamber."

"I should think that the whole roof of the mine might fall in," said Foster.

"There is some danger of that," returned his uncle, "and on this account many large timbers are used to brace the roof. Many columns of coal reaching from floor to ceiling are left standing, and these also are supports."

"Who gathers up the coal after the explosion?" asked Herbert.

"That is done by *helpers*," replied Uncle George. "See, they are placing the coal in that small car. When it is filled they will push it out of the chamber. Then the car will be drawn to the foot of the shaft by means of a mule. Machinery then lifts it to the surface of the earth. At the top of the shaft the coal is weighed, and a record kept on a tin ticket which shows the miner's number.

"In some of the mines the drilling is done by means of compressed air, and the cars of coal hauled out by electric motors."

"How much coal can a man mine in a day?" inquired Herbert.

"The average is about two and one-half tons," replied his uncle. "Sometimes a man mines double this amount. The miner is paid according to the amount of coal that he produces. He pays his helper out of his own wages.

"There is much work to be done even after the coal is mined. The anthracite coal is put into a machine called a *breaker*. This contains revolving cylinders having strong, sharp teeth of iron. The coal falls through screens having

openings of different sizes. The largest openings are about six inches across. These are for *lump* coal. *Egg*, *nut*, *buckwheat*, and *barley* are other *sizes*, not different *kinds* of coal.

"Mixed with the coal are pieces of *slate* and other impurities. They are picked out by boys called *breaker-boys*.

"Next," said Uncle George, "comes the shipment of the coal. Much of it is shipped by rail, and a great deal is shipped by water. Much coal is floated down the Delaware River on barges. Many of the barges are joined together to form a great raft. On the Great Lakes there are many ships, each of which carries from five to six thousand tons of coal. Such a ship can be loaded by means of machinery in less than a day.

"The most important coal-producing states," continued Uncle George, "are Pennsylvania, Ohio, West Virginia, Illinois, Alabama, and Iowa. Nearly all of our anthracite coal comes from eastern Pennsylvania, but a little is produced in Colorado and New Mexico.

" These black lumps are a great blessing to us.

Coal is our common fuel in the home. Most of our manufacturing depends upon coal. Most of the locomotives that draw our freight and passenger trains from place to place burn coal. Coal is the fuel on the great steamships that go from continent to continent. So you see it is not strange that lumps of coal are often called black diamonds. Let us not forget that we owe much to the workers who dig this precious material from the earth."

LIGHT

How cheerful the lights appear as they shine from the windows across the streets or fields on a dark night. By means of the light in our homes, on the street, in the stores, and in the cars, we have almost turned night into day. How gloomy it would seem to spend a single evening in a dark house.

People have not always been able to light their houses. For a long time the sun, moon, and stars were man's only lamps. They shine now as they did thousands of years ago, and they light every land on the face of the earth.

Have you ever seen fireflies? How often I have watched their lights gleaming through the woods and in the grass on summer nights. Often I have captured some of the little creatures, and placed them under a glass so as to see them light it up. It is said that the Indians used to tie fireflies to their hands and feet when they were hunting or traveling at night.

One of the early means of procuring light was to stick a piece of wood or a reed into the burning body of some fat bird. We would think this a very strange sort of lamp. Often the only light was furnished by a fire burning on the floor of the hut, or just outside the entrance.

After a while people learned how to make torches. Pine knots, rolls of bark, rushes, and other things were used. They were fastened to the walls of the dwellings, and of course gave a very smoky light. Even the palaces of kings and queens had no better light than this.

People had no matches in those days, so it was not a very easy matter to procure light. Sometimes fire was obtained by rubbing two sticks together very briskly. Sometimes sparks were produced by striking a piece of flint against a piece of iron or steel. Have you ever seen a spark fly as a horse's hoofs struck against a stone? These sparks from the flint and steel fell upon fine, dry material called *tinder*, thus setting fire to it. One hundred years ago the children in our own country were learning to read by the light of torches, fireplaces, and candles.

Abraham Lincoln used to lie on the floor of the log house in which he lived, and read by the light of the fire.

Long before Christ was born the people of India, Egypt, the Holy Land, and other Eastern countries used lamps. Of course they were not like those used to-day. They were made of terra cotta, stone, bronze, brass, silver, and gold. Very wealthy people used precious stones as decorations for their lamps. These early lamps were of many curious shapes. They had no chimneys, and so were very smoky. There was no kerosene oil in use at that time. Those who could afford it burned olive oil.

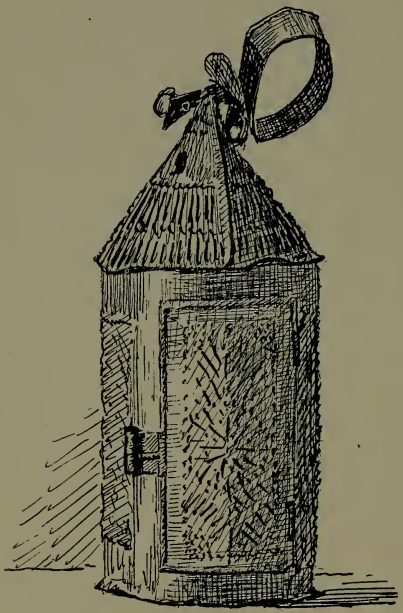

Fig. 56. — An Old-fashioned Lamp.

Little by little lamps were improved. In the year 1783, a man named Argand invented a lamp having a chimney. That was a great improvement.

About fifty years ago kerosene came into common use. Before that time whale oil was used in lamps. In order to secure the oil, fishermen went on long, dangerous voyages in search of whales. Boston and Salem sent out many whaling vessels. Locate these places on the map.

Many of the homes of our Eskimo friends are lighted by means of lamps made of shells, or of stones hollowed out. These lamps are filled with oil from the whale, walrus, or seal. Some hold not more than a half-pint, and others hold three quarts of oil. The wicks are of moss, which the Eskimo children gather during the summer.

The Eskimo calls his lamp his *ikkimer*. It is also his stove. The igloo is warmed, and the food is cooked, by means of these simple lamps.

Candles, like lamps, have been in use for a long time. At first they were very expensive. Even one hundred years ago a common candle was worth ten cents. They were generally made

of tallow. A number of wicks, placed a short distance apart, were tied to a stick or small piece of board, so that they hung vertically. They were then lowered into a vessel containing melted tallow. When the wicks were drawn out, the stick was hung up, and in a few minutes the tallow cooled and hardened about them. This was repeated until the candles were of the right size. This process was called *dipping* candles. Have you ever gathered rushes in a marsh or along a stream? People once used rushes in making candles. The outside of the rushes was stripped off, and the stalks were dipped just as the wicks were. Such candles were called *rush-lights*.

FIG. 57.—A Candlestick.

It was a great improvement when people began to make candles in molds. The molds were hollow cylinders of tin just the size of the candles. A wick, having the upper end tied to a stick, was placed in each tube of the mold. Melted tallow was then poured in. When this hardened, the

candles were pulled out. I have seen my grandmother mold candles many times.

We are so accustomed to the use of matches that it hardly seems possible that people ever got along without them. When matches were more expensive than they are now, children helped save them by rolling up bits of paper. These were often of bright colors, and were called *twisters*. By means of these, light could be carried from one candle or lamp to another.

I have told you how light was procured before matches were invented. The first matches were quite different from those in use to-day. They were pine splinters, about six inches in length, and sharpened at both ends. The ends were dipped in melted sulphur. Sparks were produced by striking a flint and steel together. The tips of these matches were placed so that the sparks would fall upon them, and cause them to burst into flame. They were called brimstone matches.

After a time there was an improvement. Matches similar to those just described were kept in small tin boxes. In each box was a

bottle containing some sulphuric acid. When a light was wanted, a match was dipped into the acid, and a flame was instantly produced. On this account the box was called the instantaneous light box.

The first matches that would produce a flame by friction were made in 1827. They were called Lucifer matches. The matches were drawn between a folded piece of sandpaper to light them. The rough surface of the paper produced heat enough to ignite them.

Fifty years ago matches were more expensive than they are now. They were cut out by hand. This was a slow process compared with the rapid way in which they are now made by machinery. A single machine can make millions of matches in a day.

Matches are made from pine planks about two inches in thickness, and free from knots. The planks are cut into blocks the length of a match. The blocks are cut into thin strips, and the strips into splinters. The heads are put on to the matches, and the matches are placed in boxes by machinery. The United States, Great Britain,

Norway, Sweden, and Japan are some of the important match-making countries.

Before people knew how to light their houses, they could do almost nothing at night. Darkness put an end to work of all kinds. Having the light of a fireplace was much better than having none at all, but you would not want to read by such a light. How wonderful it is to be able to light our homes, our stores, our streets, by gas and electric light.

Gas is of two kinds, natural and artificial. Natural gas comes from the earth. It has been known and used by the Chinese for centuries. It was carried in pipes of bamboo instead of in iron ones as it is in our country to-day. What a wonderful plant the bamboo is.

Much natural gas comes from the coal and oil region in the eastern part of our country. Wells are put down much as they are when oil is wanted, and the gas is often piped for long distances to cities and towns where it is needed.

More than one hundred years ago, a man discovered how to make artificial gas. This may be made by heating bituminous coal in great iron

tubes called *retorts*. The gas that is driven from the coal by this process, is purified and conveyed to immense tanks, where it is stored. In the manufacture of another kind of artificial gas, water is used, and on this account it is called *water gas*. It is cheaper than coal gas, and is much used.

Wonderful as gas light is, electric light is still more wonderful. It seems like a fairy tale to think of simply pressing a button and flooding a room with light. Have you ever seen the lights along the street spring out of the darkness? I have been upon a mountain top looking out over a great dark valley, when suddenly, as if by magic, a thousand lights danced where before was darkness. The lights in a whole city miles away had been turned on. It was a wonderful sight! Another wonderful thing about it was, that the energy that produced this magic light came from mountain streams many miles from the city.

Compare this method of lighting streets and homes with that employed in the past. Before gas was used most cities were dark at night.

Sometimes baskets made of iron were suspended at street corners. In these, pine knots were burned. Because of the light which we now enjoy, mills, factories, and trains can be operated at night as well as during the day. Our wonderful light makes it easy to read, study, play on musical instruments, and do countless other things at night, which it would be difficult to do without it. We enjoy many blessings which people did not enjoy in the past, and light is one of the greatest of these.

PETROLEUM

I HAVE told you how your great-grandmothers used to make candles. You remember that at one time candles used to furnish the light in all civilized homes. It is not very long since people began to use kerosene-oil lamps. Ask your grandparents about it.

Long ages before men lived on this world of ours, the plants and animals, which to-day give us our supplies of petroleum and natural gas, lived and grew. When those plants and animals died, their bodies, in some cases, gathered on the floor of some body of water. Gradually, very gradually, they were covered by sand and mud, which, after many centuries, became rock. Then two wonderful things happened — things more wonderful than the work of Cinderella's fairy godmother. One of these marvelous things was that many of the rocks, at one time the bed of the sea, were raised high above the surface of the

water, and some of them now stand as mountains. The other marvel was that through a very slow change in the bodies of the plants and animals, oil and gas were formed.

Oil is found in rock. On this account it is often called "rock-oil." That is what the word petroleum means.

Perhaps you are wondering how a rock can contain oil. You know that a piece of wood that has been in water for some time is much heavier than it is after it has dried. There are small spaces between the particles of wood, in which the water is gathered and held.

Certain rocks, such as sandstone and shale, are rather *porous*. That is, there is room between their particles for some liquid. It is in these rocks that petroleum is found.

Below the rock containing the oil, there must be other rock through which the oil cannot pass. What kind of rock would prevent the oil from passing through it? Above the oil there must also be rock that will prevent its escape. Wells are sunk into the rock containing the oil, and the oil is pumped out. Sometimes it spouts out

with great force, rising many feet into the air.

When the oil comes from the rock, it is usually dark in color. After it has been refined it is colorless. Kerosene, benzene, naphtha, and gasoline are made by refining petroleum.

Oil is lighter than water, and so will float on the surface of a pond or stream. In early days people used to place blankets on the surface of streams upon which oil was floating. When the blankets had absorbed considerable oil, they were carefully removed and wrung. In other places where oil was quite thick, it was skimmed from the water by means of boards. At that time people did not burn oil. It was used as a medicine.

In the year 1852, a man named Kier distilled some petroleum, and used it in a lamp. It did not burn very well, however.

Seven years after that the first oil well was sunk. That was in Pennsylvania. When the men quit work one Saturday evening, the well was sixty-nine and one-half feet deep. There was no oil in sight. The following day one of the workmen passed by the well and

looked in. To his surprise it was nearly filled with oil. That well yielded about twenty-five barrels daily.

That caused great excitement. Other men drilled wells and pumped out oil. To-day the

Fig. 58. — Oil Derricks at Los Angeles, California.

oil industry is one of the most important in the world.

When men wish to drill an oil well, a *derrick* is erected over the spot where they expect to find oil. An iron pipe is then driven into the

earth. Inside of this, a sharp steel instrument called a *drill* works. At the surface of the earth the pipe may be ten inches in diameter. At the bottom of the well it may be but two. Sometimes oil is found near the surface of the earth;

Fig. 59. — Oil Wells along the Coast, Summerland, California.

sometimes the wells are two or three thousand feet deep.

It costs a great deal to sink a deep well. Sometimes a single well will cost several thousand dollars. Many wells are drilled from which

no oil is ever pumped. They are called *dry wells*.

In order to make a basin at the bottom of the well a few gallons of *nitroglycerin* are carefully lowered to the base of the tube. That is a very explosive substance. Next an iron weight is dropped into the well.

Shooting the wells is very dangerous work. When the charge is lowered, the men hurry with flying feet to a place of safety. With eager eyes and drawn breath all await the terrible explosion which results when the iron weight strikes the nitroglycerin. High into the air rise bits of rock, water, and sometimes a great quantity of oil. For days or even weeks the well may continue to spout oil. Such a well is known as a *gusher*.

A few years ago there was a great gusher at Beaumont, Texas. People traveled for miles to see the sight. It was like a waterfall turned upside down. In early days gushers sometimes poured down upon a river until a layer of oil was formed upon the water. Occasionally this caught fire, sending through the valley a great

sheet of flame which devoured boats, houses, and everything in its path.

Formerly the petroleum was carried to the refineries in wagons. Now great pipes often carry it for many miles. There is a pipe line three hundred miles in length, which extends from Olean to New York City. The oil is forced through the pipes by means of pumps.

The refineries are often situated near some large body of water so that the kerosene can be shipped cheaply. There are great refineries at New York, Philadelphia, Buffalo, Cleveland, and Chicago. Locate these cities on the map.

Our country sends much oil to foreign lands in great oil ships. These vessels are really tanks of steel, and are called tank ships. Oil is pumped into them through pipes. A large ship can be filled in about six hours.

The United States and Russia are the two greatest oil-producing countries in the world. Pennsylvania, Ohio, West Virginia, Texas, and California furnish most of our oil.

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